UNDERGRADUATE RESEARCH DAY AT THE CAPITOL FEBRUARY 18, 2022

















February 2022

Dear Participant,

Welcome to this year's Undergraduate Research Day at the Capitol! We are excited to hear about the important research being done at higher education institutions by undergraduates across the state, and look forward to the invaluable networking of students, faculty mentors, and Legislators that helps us all learn about the benefits of scientific research to the well-being of West Virginians and the economy of our state. The Division of Science, Technology and Research (STaR) within the Higher Education Policy Commission is honored to serve as a sponsor of the event.

West Virginia has a long history of research excellence and innovation. One example is the recent celebration in September 2021 of the creation of a National Historic Chemical Landmark by the American Chemical Society in Clendenin, WV, to mark the contributions of West Virginia in the creation of the world-wide petrochemical industry. The front cover of this booklet shows the early facility in Clendenin established by Carbide and Carbon Chemicals Corporation in 1921. Groundbreaking research in the separation of ethane, and the production and use of ethylene as a feedstock for petrochemicals began at this facility, and the ingenuity and hard work of West Virginians to develop and commercialize this technology has helped provide products such as plastic, automobile parts, rubber, packaging, and a myriad of others that we use every day. This is West Virginia's first National Chemical Landmark, and with the excellence in research that is being presented at the statehouse today by bright young students, we believe innovation will continue to drive West Virginia for the next 100 years.

At Undergraduate Research Day each year, we celebrate the impressive and growing contributions of undergraduates to scientific research and West Virginia's future economy. We are so proud of your achievements and look forward to hearing what makes you so passionate about your work, and how you hope to impact the citizens of our state for years to come.

Sincerely,

Julianof Sugin

Juliana Serafin, PhD Senior Director STaR Division: Science, Technology and Research West Virginia Higher Education Policy Commission

Hous	se # Partic	ipant	Presentation #
1	Zackery	Toler	48
	Christopher	Griffith	71
2	Tyler	Sine	70
3	Abigail	Jones	6
	Lillian	Bischof	29
	Emma	Rice	57
	Rebecca	Erwin	63
	Sarah	Ihlenfeld	79
	Morgan	Glass	88
	Sidra	Tahir	15
4	Sianna	King	83
	Phillip	Englund	89
8	Kareem	Ibrahim-Bacha	98
13	William	Yost	27
	Zhifang	Xie	36
	Ashton	Graley	60
14	Kasey	Lyons	91
15	Matthew	Hudson	78
16	Dalton	Lucas	49
	Kara	Cunningham	62
	James	Williamson	84
17	Logan	Mallory	18
	Amartya	Das	22
	Abby	Baird	23
	Regina	Lopez	95
18	Rachael	Caudill	14
19	Irina	Kukharskaya	4
	Abagail	Parker	12
	Baylee	Fitzwater	55
20	Nikki	Hatfield	31
	Andrew	Wall	46
22	Peyton	Burford	51
23	Brooke	McCormick	94
25	Ashlei	Kelly	10
	Robert	Snidow	30
26	Brittany	Rowe	92
27	Grace	Gallinger	32
	Joseph	Barton	33
	Sydney	Philpott	40
	Makayla	Anderson	41
	Melinda	Goda	45

PARTICIPANTS BY HOUSE DISTRICT (first authors only as provided by participants)

	Ayman	Seif	65
29	Rachel	McNeel	7
	Hailey	Cox	17
	Gregory	Panther	59
30	Valentina	Abondano	5
31	Andrew	Ellis	2
32	Elijah	Buckland	61
	Rebecca	LaRochelle	68
	Mackenzie	Miller	85
34	Sarah	Hoard	34
35	Desirae	Ledesma	19
	Mary	Edwards	21
	Rachel	Morris	25
	Lydia	Neidlinger	35
36	Faraz	Shere	44
	Bernadette	Hoffman	80
37	MaeLynn	Lansdowne	1
	Sharieli	Perez	16
	Maria	Irfan	20
	Sydney	Daniels	26
	Ajeet	Barana	38
	Haarini	Balakrishnan	96
38	Devin	Danford	37
40	Rhett	White	86
43	Catlyn	Sparks	58
	Kayla	Gibson	82
44	Tatiyana	Caesar	53
46	Meagan	Walker	66
<u>47</u>	Tanner	Lantz	9
48	Nathaniel	Palmer	43
	Madison	Hess	50
	Ashley	McCullough	64
	Falon	Snodgrass	76
	Aradhita	Yadava	97
49	Teagan	Kuzniar	69
	Chelsea	Hidalgo	73
51	Jenna	Friend	3
	Jacob	Smothers	39
	Collin	Lloyd	42
	Kelsie	Bishop	52
	Hannah	Grimm	56
	Jessica	Friedel	75
	Savannah	Mead	77

	Isabella	Balko	81
	Brady	Nicewarner	99
52	Charmaine	Riestenberg	74
53	Rebecca	Foy	13
59	Serenity	McDill	87
61	Jessica	Burke	24
	Hanna	Jandrain	28
66	Natalie	Clingan	54
67	Alyssa	Nazarok	90

II. PARTICIPANTS BY SENATE DISTRICT (first authors only as provided by participants)

Senate	e # Partici	pant	Presentation #
1	Abigail	Jones	6
	Lillian	Bischof	29
	Rebecca	Erwin	63
	Sarah	Ihlenfeld	79
	Morgan	Glass	88
	Kelsie	Bishop	52
2	Christopher	Griffith	71
	Logan	Mallory	18
	Baylee	Fitzwater	55
	Tyler	Sine	70
	Chelsea	Hidalgo	73
	Hannah	Grimm	56
3	Sidra	Tahir	15
4	Devin	Danford	37
	Kasey	Lyons	91
	Matthew	Hudson	78
	Andrew	Wall	46
	Peyton	Burford	51
	Emma	Rice	57
5	Dalton	Lucas	49
	James	Williamson	84
	Rachael	Caudill	14
6	Irina	Kukharskaya	4
	Abagail	Parker	12
	Nikki	Hatfield	31
	Ashlei	Kelly	10
	Robert	Snidow	30
	Sydney	Philpott	40
	Brittany	Rowe	92

	Grace	Gallinger	32
	Joseph	Barton	33
	Melinda	Goda	45
	Ayman	Seif	65
7	Kara	Cunningham	62
_	Brooke	McCormick	94
8	MaeLynn	Lansdowne	1
	Abby	Baird	23
	William	Yost	27
	zhifang	Xie	36
	Ashton	Graley	60
	Desirae	Ledesma	19
	Lydia	Neidlinger	35
	Sianna	King	83
9	Valentina	Abondano	5
	Makayla	Anderson	41
	Rachel	McNeel	7
	Hailey	Cox	17
	Andrew	Ellis	2
10	Elijah	Buckland	61
	Rebecca	LaRochelle	68
	Mackenzie	Miller	85
11	Zackery	Toler	48
	Catlyn	Sparks	58
	Kayla	Gibson	82
	Tatiyana	Caesar	53
12	Sarah	Hoard	34
	Meagan	Walker	42
	Nathaniel	Palmer	43
	Madison	Hess	50
	Ashley	McCullough	64
	Falon	Snodgrass	76
	Aradhita	Yadava	97
13	Teagan	Kuzniar	69
	Jenna	Friend	3
	Jacob	Smothers	39
	Jessica	Friedel	75
	Savannah	Mead	77
	Isabella	Balko	81
	Brady	Nicewarner	99
14	Tanner	Lantz	9
	Charmaine	Riestenberg	74
	Rebecca	Foy	13

15	Phillip	Englund	89
	Gregory	Panther	59
	Serenity	McDill	87
16	Jessica	Burke	24
	Hanna	Jandrain	28
	Natalie	Clingan	54
	Alyssa	Nazarok	90
17	Amartya	Das	22
	Mary	Edwards	21
	Rachel	Morris	25
	Bernadette	Hoffman	80
	Sharieli	Perez	16
	Maria	Irfan	20
	Sydney	Daniels	26
	Ajeet	Barana	38
	Faraz	Shere	44
	Haarini	balakrishnan	96
	Rhett	White	86
	Regina	Lopez	95
	Kareem	Ibrahim-Bacha	98

III. OUT-OF-STATE PARTICIPANTS (first authors only as provided by participants)

State/Country Participant		icipant	Presentation #
MD	Madison	Morgan	67
	Madison	Robinson	72
	<u>Olivia</u>	Rodgers	93
NC	Danielle	Baker	11
OH	Amanda	McGlone	8
	Collin	Lloyd	42
TN	Andrew	Wilson	100

IV. PARTICIPANTS BY FIELD (first authors only)

Agriculture		Presentation #
MaeLynn	Lansdowne	1
Andrew	Ellis	2
Jenna	Friend	3
<u>Biochemistry</u>		Presentation #
Irina	Kukharskaya	4
Valentina	Abondano	5
Abigail	Jones	6
Rachel	McNeel	7
Biology		Presentation #
Amanda	McGlone	8

	Tanner	Lantz	9
	Ashlei	Kelly	10
	Danielle	Baker	11
	Abagail	Parker	12
	Rebecca	Foy	13
	Rachael	Caudill	14
	Sidra	Tahir	15
	Sharieli	Perez	16
	Hailey	Cox	17
	Logan	Mallory	18
	Desirae	Ledesma	19
	Maria	Irfan	20
	Mary	Edwards	21
	Amartya	Das	22
	Abby	Baird	23
	Jessica	Burke	24
	Rachel	Morris	25
	Sydney	Daniels	26
Biom	nedical		Presentation #
	William	Yost	27
	Hanna	Jandrain	28
Chen	nical Engineeri	na	Presentation #
	incar Engineen	ng	11050111011 #
	Lillian	Bischof	29
Chen	Lillian Listry	Bischof	29 Presentation #
Chen	Lillian nistry Robert	Bischof Snidow	29 Presentation # 30
<u>Chen</u>	Lillian <u>nistry</u> Robert Nikki	Bischof Snidow Hatfield	Presentation # 29 Presentation # 30 31
Chen	Lillian <u>nistry</u> Robert Nikki Grace	Bischof Snidow Hatfield Gallinger	Presentation # 29 Presentation # 30 31 32
<u>Chen</u>	Lillian <u>nistry</u> Robert Nikki Grace Joseph	Bischof Snidow Hatfield Gallinger Barton	Presentation # 29 Presentation # 30 31 32 33
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah	Bischof Snidow Hatfield Gallinger Barton Hoard	Presentation # 29 Presentation # 30 31 32 33 34
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger	Presentation # 29 Presentation # 30 31 32 33 34 35
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie	Presentation # 29 Presentation # 30 31 32 33 34 35 36
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38
Chen	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39
<u>Chen</u>	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob munity Health	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation #
<u>Chen</u>	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob munity Health Sydney	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40
<u>Chen</u>	Lillian <u>nistry</u> Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob <u>munity Health</u> Sydney Makayla	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41
<u>Chen</u>	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob munity Health Sydney Makayla Collin	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson Lloyd	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41 42
<u>Chen</u>	Lillian <u>nistry</u> Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob <u>munity Health</u> Sydney Makayla Collin Nathaniel	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson Lloyd Palmer	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41 42 43
<u>Chen</u>	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob munity Health Sydney Makayla Collin Nathaniel Faraz	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson Lloyd Palmer Shere	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41 42 43 44
<u>Com</u>	Lillian <u>nistry</u> Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob <u>munity Health</u> Sydney Makayla Collin Nathaniel Faraz <u>puter Science</u>	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson Lloyd Palmer Shere	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41 42 43 44 Presentation #
<u>Chen</u>	Lillian nistry Robert Nikki Grace Joseph Sarah Lydia Zhifang Devin Ajeet Jacob munity Health Sydney Makayla Collin Nathaniel Faraz puter Science Melinda	Bischof Snidow Hatfield Gallinger Barton Hoard Neidlinger Xie Danford Barana Smothers Philpott Anderson Lloyd Palmer Shere Goda	Presentation # 29 Presentation # 30 31 32 33 34 35 36 37 38 39 Presentation # 40 41 42 43 44 Presentation # 45

Patricia	Alonso Munoz	47
Zackery	Toler	48
Dalton	Lucas	49
Creative Arts		Presentation #
Madison	Hess	50
Creative Arts		Presentation #
Peyton	Burford	51
Dental Hygiene		Presentation #
Kelsie	Bishop	52
Tatiyana	Caesar	53
Natalie	Clingan	54
Baylee	Fitzwater	55
Hannah	Grimm	56
Emma	Rice	57
Catlyn	Sparks	58
Engineering		Presentation #
Gregory	Panther	59
Ashton	Graley	60
Elijah	Buckland	61
Kara	Cunningham	62
Rebecca	Erwin	63
Ashley	McCullough	64
Ayman	Seif	65
Environmental Geose	cience	Presentation #
Meagan	Walker	66
Environmental Studi	es	Presentation #
Madison	Morgan	67
Rebecca	LaRochelle	68
Teagan	Kuzniar	69
Exercise Science		Presentation #
Tyler	Sine	70
Christopher	Griffith	71
Madison	Robinson	72
Fashion		Presentation #
Chelsea	Hidalgo	73
Fashion Design Stud	ies	Presentation #
Charmaine I	Riestenberg	74
Forensic Science		Presentation #
Jessica	Friedel	75
History		Presentation #
Falon	Snodgrass	76
Horticulture		Presentation #
Savannah	Mead	77

Immunology and M	edical Micobiology	Presentation #
Matthew	Hudson	78
International Studie	S	Presentation #
Sarah	Ihlenfeld	79
Mathematics		Presentation #
Bernadette	Hoffman	80
Medicine		Presentation #
Isabella	Balko	81
Mineral Processing		Presentation #
Kayla	Gibson	82
Music		Presentation #
Sianna	King	83
Neuroscience	-	Presentation #
James	Williamson	84
Mackenzie	Miller	85
Rhett	White	86
Nursing		Presentation #
Serenity	McDill	87
Pharmaceutical Scie	ences	Presentation #
Morgan	Glass	88
Physiology		Presentation #
Phillip	Englund	89
Political Science		Presentation #
Alyssa	Nazarok	90
Kasey	Lyons	91
Psychology		Presentation #
Brittany	Rowe	92
Olivia	Rodgers	93
Brooke	McCormick	94
Regina	Lopez	95
Haarini	Balakrishnan	96
Aradhita	Yadava	97
Kareem	Ibrahim-Bacha	98
Reproductive Physic	ology	Presentation #
Brady	Nicewarner	99
Sociology/Social W	ork	Presentation #
Andrew (AJ) Wilson	100

Business		Presentation #
Devin Danford		37
Creative Arts		Presentation #
Madison	Hess	50
Peyton	Burford	51
Charmaine	Riestenberg	74
Education		Presentation #
Sianna	King	83
Engineering		Presentation #
Lillian	Bischof	29
Gregory	Panther	59
Ashton	Graley	60
Elijah	Buckland	61
Kara	Cunningham	62
Rebecca	Erwin	63
Ashley	McCullough	64
Ayman	Seif	65
Madison	Morgan	67
Kayla	Gibson	82
Health Sciences		Presentation #
Rachel	McNeel	7
Hanna	Jandrain	28
Sydney	Philpott	40
Makayla	Anderson	41
Nathaniel	Palmer	43
Faraz	Shere	44
Kelsie	Bishop	52
Tatiyana	Caesar	53
Natalie	Clingan	54
Emma	Rice	57
Catlyn	Sparks	58
Tyler	Sine	70
Christopher	Griffith	71
Madison	Robinson	72
Matthew	Hudson	78
Isabella	Balko	81
James	Williamson	84
Mackenzie	Miller	85
Rhett	White	86
Serenity	McDill	87
Morgan	Glass	88

V. PARTICIPANTS BY BROAD CATEGORY (first authors only)

	Phillip	Englund	89
Huma	nities	-	Presentation #
	Falon	Snodgrass	76
	Olivia	Rodgers	93
Other			Presentation #
	Hannah	Grimm	56
	Chelsea	Hidalgo	73
Scienc	ces		Presentation #
	MaeLynn	Lansdowne	1
	Andrew	Ellis	2
	Jenna	Friend	3
	Irina	Kukharskaya	4
	Valentina	Abondano	5
	Abigail	Jones	6
	Amanda	McGlone	8
	Tanner	Lantz	9
	Ashlei	Kelly	10
	Danielle	Baker	11
	Abagail	Parker	12
	Rebecca	Foy	13
	Rachael	Caudill	14
	Sidra	Tahir	15
	Sharieli	Perez	16
	Hailey	Cox	17
	Logan	Mallory	18
	Desirae	Ledesma	19
	Maria	Irfan	20
	Mary	Edwards	21
	Amartya	Das	22
	Abby	Baird	23
	Jessica	Burke	24
	Rachel	Morris	25
	Sydney	Daniels	26
	William	Yost	27
	Robert	Snidow	30
	Nikki	Hatfield	31
	Grace	Gallinger	32
	Joseph	Barton	33
	Sarah	Hoard	34
	Lydia	Neidlinger	35
	Zhifang	Xie	36
	Ajeet	Barana	38
	Jacob	Smothers	39

Melinda	Goda	45
Patricia	Alonso Munoz	47
Zackery	Toler	48
Dalton	Lucas	49
Baylee	Fitzwater	55
Meagan	Walker	66
Rebecca	LaRochelle	68
Teagan	Kuzniar	69
Jessica	Friedel	75
Savannah	Mead	77
Brady	Nicewarner	99
Social Sciences		Presentation #
Collin	Lloyd	42
Sarah	Ihlenfeld	79
Bernadette	Hoffman	80
Alyssa	Nazarok	90
Kasey	Lyons	91
Brittany	Rowe	92
Brooke	McCormick	94
Regina	Lopez	95
Haarini	Balakrishnan	96
Aradhita	Yadava	97
Kareem	Ibrahim-Bacha	98
Andrew (AJ)	Wilson	100
Technology		Presentation #
Andrew	Wall	46

VI. PARTICIPANTS BY INSTITUTION (first authors only)

Alderson Broaddus	s University	Presentation #
Tanner	Lantz	9
Bluefield State Col	llege	Presentation #
Ashlei	Kelly	10
Danielle	Baker	11
Concord University		Presentation #
Nikki	Hatfield	31
Robert	Snidow	30
Brittany	Rowe	92
Grace	Gallinger	32
Joseph	Barton	33
Sydney	Philpott	40
Melinda	Goda	45

Andrew (AJ)	Wilson	100
Fairmont State University		Presentation #
Christopher	Griffith	71
Tyler	Sine	70
Marshall University		Presentation #
James	Williamson	84
Rachael	Caudill	14
Irina	Kukharskaya	4
Abagail	Parker	12
Andrew	Wall	46
Sarah	Hoard	34
Rebecca	Foy	13
Madison	Morgan	67
Shepherd University		Presentation #
Sianna	King	83
Alyssa	Nazarok	90
Olivia	Rodgers	93
University of Charles	ton	Presentation #
Kasey	Lyons	91
Regina	Lopez	95
Brooke	McCormick	94
Hailey	Cox	17
Lydia	Neidlinger	35
Sharieli	Perez	16
Sydney	Daniels	26
Haarini	Balakrishnan	96
Sidra	Tahir	15
Patricia	Alonso Munoz	47
West Virginia State U	Jniversity	Presentation #
Zackery	Toler	48
William	Yost	27
Zhifang	Xie	36
Dalton	Lucas	49
Logan	Mallory	18
Amartya	Das	22
Abby	Baird	23
Andrew	Ellis	2
Desirae	Ledesma	19
Mary	Edwards	21
Bernadette	Hoffman	80
MaeLynn	Lansdowne	1
Maria	Irfan	20
Ajeet	Barana	38

Devin	Danford	37
Amanda	McGlone	8
West Virginia Univ	ersity	Presentation #
Abigail	Jones	6
Phillip	Englund	89
Matthew	Hudson	78
Kara	Cunningham	62
Baylee	Fitzwater	55
Peyton	Burford	51
Makayla	Anderson	41
Ayman	Seif	65
Rachel	McNeel	7
Lillian	Bischof	29
Emma	Rice	57
Rebecca	Erwin	63
Sarah	Ihlenfeld	79
Morgan	Glass	88
Rachel	Morris	25
Rhett	White	86
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Kayla	Gibson	82
Tatiyana	Caesar	53
Nathaniel	Palmer	43
Madison	Hess	50
Ashley	McCullough	64
Falon	Snodgrass	76
Aradhita	Yadava	97
Teagan	Kuzniar	69
Chelsea	Hidalgo	73
Jenna	Friend	3
Jacob	Smothers	39
Kelsie	Bishop	52
Hannah	Grimm	56
Jessica	Friedel	75
Savannah	Mead	77
Isabella	Balko	81
Brady	Nicewarner	99
Charmaine	Riestenberg	74
Serenity	McDill	87
Jessica	Burke	24
Hanna	Jandrain	28
Natalie	Clingan	54

Meagan	Walker	66
Collin	Lloyd	42
Madison	Robinson	72
Faraz	Shere	44
West Virginia University Institute of Technology Prese		Presentation #
Ashton	Graley	60
Gregory	Panther	59
Valentina	Abondano	5
Elijah	Buckland	61
Rebecca	LaRochelle	68
Mackenzie	Miller	85





1. Long-Term Impact of Mine Reclamation On Stream Water Quality in West Virginia

MaeLynn Lansdowne (Martinsburg, WV)

Institution: West Virginia State University Field: Sciences (Agriculture) Faculty Advisor: Amir Hass

Surface coal mining are common operations in the Central Appalachian Region that result in land disturbances, the long-term impact of which on water quality and ecosystem is not clear. In this project we use a paired-watershed study to evaluate the impact of Mountain-top Removal Valley-Fill operation (MTR-VF) on stream water quality 25 years after mining completed and 15 years after reclamation and final bond release. The study site is located in south-central WV and is monitored continuously since the fall of 2019. We sampling and monitoring creek water exiting the MTR-VF, and simultaneously sampling and comparing the watershed water quality to that of an adjacent non-disturbed watershed. Our results show a consistent seasonal and annual trends. Water quality of the MTR-VF is still adversely affected by the previous mining activities and disturbances. Further findings will be presented and discussed in more details. Overall, there are many legacy sites in WV and throughout Appalachia that experience similar impairment. We expect and hope this study to better help in evaluating and understanding reclamation practices and processes to improve our environment and natural ecosystem moving forward.

Funding: Title III Part B of the Higher Education Act of 1965

2. Biochar Applications Effect on Soil Fertility

Andrew Ellis (Glen Daniel, West Virginia)

Institution: West Virginia State University Field: Sciences (Agriculture) Faculty Advisor: Amir Hass

Soils in West Virginia are poor and of low fertility and productivity which creates a massive problem. Plants and trees cannot grow if a soil isn't fertile enough. With the long history of surface mining here in West Virginia our soils in some places are very damaged and not fertile. Our attempt at a solution is biochar. Biochar when applied to soil has shown evidence in the past of making soils more fertile. A few reasons biochar could help with the soil inside of West Virginia is because when applied to soil it not only adds nutrients to the soil, but also helps keep the nutrients inside the soil preventing them to wash out. Using a column experiment we will arrange a number of columns and steadily increase the amount of biochar we add to each different treatment. Treatment 0 having no biochar and treatment 7 having the most biochar. We will then put the columns through wet and dry cycles, and we will test the water poured through the columns to see if the biochar is doing any nutrient retention. This study will tell us if biochar is helping and making a difference, and it also tells us the optimal percentage of biochar to use if it does work. We hope we can use this biochar to improve the soils in West Virginia to further restore the land destroyed by surface mining.

Funding: West Virginia State University and the Title III Part B of the Higher Education Act of 1965

3. The Effect of Varying Steam Conditioning on Enzyme Products in a Pelleted Broiler Diet Jenna Friend (Morgantown, West Virginia)

Institution: West Virginia University Field: Sciences (Agriculture) Faculty Advisor: Joe Moritz

Commercial poultry diets are typically pelleted, involving exposure to saturated steam in a conditioner and frictional force within the pellet die during extrusion. For feed enzymes to have efficacy within the gastrointestinal tract of the bird, the enzymes must be thermally tolerant of the pelleting process. The objective of this study was to determine the activity of eight enzyme products in a corn and soybean meal-based diet post pelleting. Enzymes were added at the mixer to 454 kg of basal diet. Each experimental diet was conditioned at 82 °C and then 88 °C for 15 seconds and subsequently pelleted through a 4.7 x 38 mm pellet die. Descriptive pelleting conditions were recorded and pellet quality assessed. Mash and pelleted samples were analyzed for enzyme recovery by two different commercial analytical laboratories. Pellet mill motor load and pellet quality decreased and increased respectively due to increasing conditioning temperature. Most enzymes demonstrated similar trends in activity regardless of laboratory. Enzymes 1, 2, and 3 did not vary in activity due to conditioning temperature while enzymes 4 and 8 decreased in activity due to 88 °C conditioning. Activity of enzymes 5, 6, and 7 were dependent on analytical laboratory. Analytical activity of enzymes post pelleting may predict enzyme efficacy in vivo; however, laboratory bias may influence results.

4. Effect of Epigenetic Drift on Aging

Irina Kukharskaya (Wayne, WV)

Institution: Marshall University Field: Sciences (Biochemistry) Faculty Advisor: Vincent Sollars

"What are the molecular defects that promote age-related dysfunction?" The emerging importance of epigenetic gene regulation in the aging process necessitates not only our understanding of which genes are potential targets but how the process of epigenetic drift results in dysfunctional stem cells. Understanding the mechanisms that promote evolution of the epigenome and its increasing dysfunction with age in stem cells is critical to therapeutic strategies targeting aging. Thus, we propose to investigate canalization as a mechanism of molecular evolution of the epigenome in a mammalian system of epigenetic drift and clonal hematopoiesis. The results of our investigations in the Drosophila and murine model systems indicate a very important gene in canalization, heat shock protein 90 (HSP90), is well connected to epigenetic gene regulation and phenotypic plasticity.

This proposal is designed to test the hypothesis that inhibition of HSP90 results in changes in histone acetylation that, in turn, prevent epigenetic drift and loss of phenotypic plasticity in hematopoietic stem cells.

The approach is to test the hypothesis in vitro using our epigenetic drift model. We will exploit the connection between epigenetics and cellular differentiation in studies of differentiation using our EML hematopoietic stem cell model. The major tool of the investigation will be flow cytometry analysis of differentiation and epigenetic drift of cells from a stem cell state into a progenitor state. Modulation of HSP90 levels will be performed in this system, followed by analyses of the ability of hematopoietic cells to functionally produce mature cells of the immune system.

Funding: Marshall University

5. Understanding DNA Hairpin-Silver Nanocluster Conformations Using Molecular Dynamics Simulations

Valentina Abondano (Beckley, West Virginia)

Institution: West Virginia University Institute of Technology Field: Sciences (Biochemistry) Faculty Advisor: Taejin Kim

The combination of the antibacterial activity of silver and modern nucleic acids nanotechnology can be used to develop biomolecular based disinfectants and antibacterial applications. The high binding affinity of silver cations for the N3 atom of cytosines has triggered the wide range of optical and structural studies of DNA templated silver nanoclusters (AgNCs). Our experimental group utilized four different sizes of cytosine rich DNA hairpin (hp) structures to investigate the optical and antibacterial activity of DNAhp-AgNCs. Experimental group discovered that AgNC has a capability of inhibiting bacterial growth comparable to carbenicillin, which is a bactericidal antibiotic from the penicillin group. It has been also confirmed that DNAhp-AgNCs have very little toxicity against human cells. In addition, the distinct fluorescence of different sizes in the DNAhp-AgNCs can be dual benefits of utilizing DNAhp-AgNC as antibacterial as well as bioimaging agents. In this study, we use explicit molecular dynamics (MD) simulations to investigate the role of Ag cations in the four different sizes of cytosine rich DNAhp conformations. When no Ag cations bind to cytosine, MD simulations show that cytosine bases are folded inside hairpin loop and stacking to each other. When Ag cations are present, the hairpin structure is stabilized by cytosine-Ag-cytosine interactions. In addition, cytosine bases where their backbones are highly bent orient outside the hairpin loop rather than forming cytosine-Ag-cytosine interactions. Based on our experimental and computational studies, we will investigate nucleic acids nanostructures with AgNC.

6. Identification and genetic manipulation of fungi that produce pharmaceutically important compounds

Abigail Jones (Wheeling, WV) Lauren Bish (Lancaster, NY)

Institution: West Virginia University Field: Sciences (Biochemistry) Faculty Advisor: Daniel Panaccione

Ergot alkaloids are fungal compounds that interact with neurotransmitters in humans and animals. They can be used as pharmaceuticals to treat migraines, dementia, and hyperprolactinemia. We understand many of the steps in the pathway of making ergot alkaloids, however there are still a few steps that need further investigation. The fungi that are currently used industrially to produce these compounds are slow growing and difficult to modify genetically, providing motivation to identify more ideal industrial organisms. Our goals are to understand the biochemical pathway that leads to production of ergot alkaloids so that we can modify the alkaloids or make their production more efficient. We have identified new groups of fungi that can make ergot alkaloids that may have scientific and industrial relevance. By investigating databases of genomic sequence data, we found several species of fungi in the genus Aspergillus that produce large amounts of ergot alkaloids. We also found novel genes, and we are working on identifying their function through CRISPR-based studies and by expressing them in other fungi. We are also interested in determining the natural function of these chemicals and are investigating the possibility that they provide their producing fungi with the ability to parasitize insects. By optimizing and understanding the production of ergot alkaloids, we may improve the efficiency of their production and allow for the engineering of new pharmaceuticals.

Funding: Arnold and Mabel Beckman Foundation, NIH

7. Early metabolic hallmarks of the eye and brain in Alzheimer's disease

Rachel McNeel (Morgantown, WV)

Institution: West Virginia University Field: Health Sciences (Biochemistry) Faculty Advisor: Jianhai Du

Alzheimer's disease (AD) is the leading cause of dementia and death in the elder populations. AD patients often have visual symptoms preceding neurological symptoms. Metabolic deficits have been proposed as one of the early causes for AD pathology in the eyes and brain. However, the early changes in the eye and brain metabolism remain unknown. The goal of this study is to identify early metabolic changes caused by AD in the eyes and brain for early diagnosis. To model early-onset AD in humans, we used 1-month old 3xTG-AD mice, which carry mutations of three key genes in human AD patients and show AD-like phenotype starting around 9 months. We performed targeted metabolomics using mass spectrometry in the eye, brain, and plasma of the AD model mice. We identified significantly different metabolic profiles in the eye and brain tissues from the AD mice compared to their controls. Among the changed metabolites, phosphocreatine (P-Cr), essential for ATP synthesis, and pantothenate, essential for mitochondrial and lipid metabolism, increased the most in the ocular tissues and the brain of the AD mice. In conclusion, the eye emulates key metabolic changes in the brain at the very early stages of AD, and several energy-related metabolites are upregulated, suggesting that early metabolic deficits might be critical for the pathogenesis of AD.

8. Expanding the Species Diversity of the Tapeworm Genus Anthocephalum

Amanda McGlone (Cross Lanes, West Virginia)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Tim Ruhnke

The tapeworm genus *Anthocephalum* contains 24 species, primarily parasitic in stingrays. Actual diversity of new *Anthocephalum* species in our collection perhaps doubles the diversity. My Summer SURE research focused on morphological investigation of potential new species. Observations and measurements have been completed on 65 specimens consistent with the generica diagnosis of *Anthocephalum*. These 65 specimens group into 10 study series. I am in the process of differentiating these series from known species of *Anthocephalum*. Morphological measurements used for differentiation include the total worm length, the length of the genital pore, the ovary numbers as well as the number of bothridial loculi, the number of testes, and number of proglottids. The differences could potentially set apart a group of worms creating a species differentiation.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

9. Gallic Acid inhibits cell growth and induces Apoptosis in cancer cells

Tanner Lantz (Philippi, West Virginia)

Institution: Alderson Broaddus University Field: Sciences (Biology) Faculty Advisor: Yi Chen

Ovarian cancer is the 5th leading cause of cancer deaths for women in America. Non-small cell lung cancer (NSCLC) is characterized by rapid progression and low survival rates. Various pharmacological activities of gallic acid (GA) have been reported, including anti-inflammatory, antiatherosclerotic, anticarcinogenic, and antioxidant activities. Several studies have also demonstrated that GA selectively induced cancer cell death by apoptosis. In this research, the inhibitory effect of GA on ovarian cancers cells (OVCAR-3) and NSCLC cells (H838) were investigated. Apoptosis was visualized using a ZEISS fluorescence microscope after cancer cells were stained. Cell viability was analyzed with a MTS-based Cell Titer 96 AQueous One Solution Cell Proliferation Assay. Our study showed that GA induced apoptosis of ovarian cancer cell line (OVCAR-3) and lung cancer cell line (H838) and enhanced the Caspase 3/7 activities at 10 μ M. At 5 μ M, GA significantly inhibited cancer cell viability. Our results showed GA has great potential for angio-prevention and treatment of ovarian cancers and lung cancers. *(Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence)*

Funding: WV-INBRE

10. Effect of cold-induced stress on macrophage cytokine production in mice during chlamydia genital infection. Ashlei Kelly (Bluefield, WV)

Institution: Bluefield State College Field: Sciences (Biology) Faculty Advisor: Tesfaye Belay

Cold-induced stress (CIS) is known to inhibit immune cell activity and has been shown to cause different expressions of cytokine profiles during Chlamydia muridarum genital infection. Our lab has demonstrated that CIS works through the beta2 adrenergic receptor (β 2-AR) and generates an altered cytokine production in immune cells. The purpose of this study was to investigate if **β2-AR** agonists and antagonists would have any effect on the function of bone marrow-derived dendritic cells (BMDCs) measured by viable cell counts and cytokine production. We hypothesize that CIS leads to altered cell counts after treatment with β 2-AR agonists and antagonists and increased production of proinflammatory cytokines by BMDCs. Bone-marrow-derived cells were differentiated for eight days in the presence of granulocytemacrophage colony-stimulating factor (GMCSF). Floating cells were harvested and treated with lipopolysaccharide (LPS), norepinephrine, fenoterol, or ICI-118,551 for 24 h, and cells were counted for viability. Data show that NE decreases the viability to 58.8% of WT BMDCS compared to 83% % of BMDCS of β 2-AR KO mice. Culture supernatant showed increased production of IL-1 β , TNF- α and IL-12 cytokines using ELISA. This work will help to understand how CIS influences the function of mouse BMDCS during chlamydia genital infection. The overall data suggest that NE $-\beta$ 2-AR interaction negatively affects the function of BMDCs during genital infection; however, further studies are needed to fully understand the mechanisms involved in modulating the function of DCS during chlamydia genital infection under stressful conditions.

Funding: WV-INBRE of NIH Grant, NIH grant, McNair Scholarship of Concord University

11. Effect of cold-induced stress on cytokine production of dendritic cells in mice during chlamydia genital infection.

Danielle Barker (North Carolina)

Institution: Bluefield State College Field: Sciences (Biology) Faculty Advisor: Tesfaye Belay

Cold-induced stress (CIS) is known to inhibit immune cell activity and has been shown to cause different expressions of cytokine profiles during Chlamydia muridarum genital infection. Our lab has demonstrated that CIS works through the beta2 adrenergic receptor (β 2-AR) and generates an altered cytokine production in immune cells. The purpose of this study was to investigate if β2-AR agonists and antagonists would have any effect on the function of bone marrow-derived dendritic cells (BMDCs) measured by viable cell counts and cytokine production. We hypothesize that CIS leads to altered cell counts after treatment with β 2-AR agonists and antagonists and increased production of proinflammatory cytokines by BMDCs. Bone-marrowderived cells were differentiated for eight days in the presence of granulocyte-macrophage colonystimulating factor (GMCSF). Floating cells were harvested and treated with lipopolysaccharide (LPS), norepinephrine, fenoterol, or ICI-118,551 for 24 h, and cells were counted for viability. Data show that NE decreases the viability to 58.8% of WT BMDCS compared to 83% % of BMDCS of β2-AR KO mice. Culture supernatant showed increased production of IL-1β, TNF-α and IL-12 cytokines using ELISA. This work will help to understand how CIS influences the function of mouse BMDCS during chlamydia genital infection. The overall data suggest that NE - β2-AR interaction negatively affects the function of BMDCs during genital infection; however, further studies are needed to fully understand the mechanisms involved in modulating the function of DCS during chlamydia genital infection under stressful conditions.

Funding: WV-INBRE of NIH Grant, NIH grant, McNair Scholarship of Concord University

12. Differentiating three species of yellow-faced bees (*Hylaeus*, Colletidae) using the COI DNA barcode

Abagail Parker (Fort Gay, WV)

Institution: Marshall University Field: Sciences (Biology) Faculty Advisor: Pamela Puppo

Pollinators play a vital role maintaining the biodiversity of our ecosystems by providing pollination services that allow flowering plants and crops to reproduce and form fruit. Due to the steady decline in managed honeybee populations due to parasites, disease, the increased use of pesticides, and climate variability, we have to rely even more on wild bees for pollination services. Wild bees specialize in pollinating specific groups of plants and are therefore more effective pollinators than the generalist honeybee. Unfortunately, wild bees are largely unknown and the research I am currently working on intends to fill this knowledge gap. Among the wild bees occurring in the Southeast USA, the yellow-faced bees (genus Hylaeus, family Colletidae) are important pollinators to crops such as carrots, clover, and other plants in different families like the blueberry family and the mint family. Yellow-faced bees are morphologically very similar which makes the species difficult to differentiate. The goal of my research is to use a section of mitochondrial DNA (the cytochrome c oxidase subunit I or COI barcode) to differentiate three species of yellow-faced bees: Hylaeus illinoisensis, H. modestus, and H. affinis. I extracted the DNA and amplified the COI barcode of four museum samples and used these along with other COI sequences downloaded from the online Barcode of Life Database (BOLD) to- build a phylogenetic tree. With this we aim to see if the COI barcode can help differentiate among these three morphologically similar Hylaeus species and thus aid in their identification.

Funding: Marshall University Research Corporation

13. Leaf blight disease as biological control of the invasive Japanese stiltgrass Rebecca Foy (Aurora, WV)

Institution: Marshall University Field: Sciences (Biology) Faculty Advisor: Pamela Puppo

Invasive plants disrupt ecosystems and harm natural resources, causing billions of dollars in damage each year. They compete for resources like water, sunlight, and nutrients, and are a major cause of native species decline and extinction next to habitat destruction. Management plans to control these species are time-consuming and costly. Japanese stiltgrass (Microstegium vimineum) is an invasive grass from Asia taking over eastern US forests. Recently, several populations of Japanese stiltgrass have shown signs of severe leaf blight infection. This disease, caused by Bipolaris fungi, decreases Japanese stiltgrass population densities and seed production, and could potentially be used as biological control to limit its growth. However, little is known about why some stiltgrass populations are more affected by the fungi than others. Our research aims to assess whether disturbance of natural areas play a role in *Bipolaris* leaf blight severity. Since Bipolaris species are native to the US, it is hypothesized that Bipolaris infection would be greater in natural (undisturbed) areas, decreasing Japanese stiltgrass abundance there. Field observations suggest that *Bipolaris* leaf blight was more prevalent in moderately disturbed areas. Our preliminary molecular results suggest that the abundance of lesions on Japanese stiltgrass leaves correlate with the amount of fungal infection. Further analyses will be needed to assess whether Bipolaris could be used as a natural biological control agent on Japanese stiltgrass invasion in the US.

Funding: National Science Foundation

14. Comparing the Pollen Collected by Two Species of Long-horned Bees (*Melissodes*, Apidae) Rachael Caudill (Barboursville, WV)

Institution: Marshall University Field: Sciences (Biology) Faculty Advisor: Pamela Puppo

Pollination, the transfer of pollen from the male part of the flower to the female part of the flower is essential for the fertilization of plants and the production of seeds and fruits. In fact, 75% of crops for human consumption rely on insect pollinators, and some like almonds, pome fruits, and melons depend completely on it. For this reason, bees play a significant role in our ecosystems. Honeybees have been domesticated for centuries for pollination services, but recent declines in their populations due to disease and parasites have turned our attention to wild bees. Wild bees specialize in particular plants and are able to pollinate them more efficiently than the generalist honeybee, but wild bees and the plants they visit are largely unknown. My research contributes to finding this much-needed information, by identifying the plants visited and probably pollinated by two species of long-horned bees that occur in the southeast USA, Melissodes agilis and M. trinodis (family Apidae). These bees are solitary, each female constructs its own nest in the ground, and are sunflower specialists, providing free pollination services to this crop. In this study, we extracted the DNA from the pollen collected by 85 bees from these two species and amplified the ITS2 and TrnL genes. With this, we identified the source of the pollen collected by these bees. Preliminary data show that *M. agilis* and *M. trinodis* collect a variety of plant species, even outside of the sunflower family, such as legumes and cabbage.

Funding: Marshall University Research Corporation

15. Inhibition of phenotypic plasticity in lung cancer through HSP90 inhibition Sidra Tahir (Annapolis, Maryland)

Institution: University of Charleston Field: Sciences (Biology) Faculty Advisor: Vincent Sollars

One of the principal challenges in cancer treatment is the recurrence of cancer after it has gone into remission. When cancer comes back, it is much more aggressive and resistant to the mainline treatments. The heat shock response is one of the factors that allow tumor cells to survive in extreme conditions and facilitate their metastasis and drug resistance. Heat Shock Protein (HSP90) is one of the most important proteins responsible for the heat shock response phenomena and has also been implicated in the two principal mechanisms of cellular change in cancers, molecular evolution, and phenotype plasticity. In 2020 it was shown that HSP90 inhibition with AUY922 can limit the acquisition of metastatic and drug-resistant phenotypes in A549 lung cancer cells at low doses. We used these findings as our control and tested four other types of cells to test the hypothesis that inhibition of HSP90 prevents phenotypic plasticity seen in the ability of lung cancer cells to transition from an epithelial to a mesenchymal cell state. We harvested SK-MES-1, H1437, H520, and EKVX lung cancer cells and treated them with appropriate doses of AUY922, an HSP90 inhibitor and we induced epithelial to mesenchymal transition (EMT) via treatment with transforming growth factor- β (TGF- β). We measured phenotype plasticity in markers CD324 (E-Cadherin) and CD326 (EpCam), markers for cells that are in their epithelial state, via a flow cytometer. Our findings will help increase the effectiveness of leading treatments by preventing adaptations through molecular evolution and phenotype plasticity in metastasis and drug resistance and cease cancer from recurring.

16. Effects of exposure to water contaminated by heavy metals on vegetation

Sharieli Perez (Charleston, West Virginia)

Institution: University of Charleston Field: Sciences (Biology) Faculty Advisor: Heather Arnett

Water pollution occurs when a water site is contaminated by harmful substances or microorganisms, such as bacteria, heavy metals, and parasites. Water pollution, specifically contamination of water sites by exposure to heavy metals such as lead, nickel, and manganese, is important due to the adverse effects on vegetation and the health issues it is causing to individuals exposed to it, including cardiovascular disorders, renal injuries, and increase risk of cancer. When it comes to its effects on vegetation, heavy metals target a plant's biomass, chlorosis (loss of green coloration in leaves), and inhibits photosynthesis, causing adverse effects on a plant's growth and development. In this study, water was experimentally tested for contamination by heavy metals and the effects it can have on vegetation by exposing beans and lettuce plants to four treatments: water contaminated with lead nitrate, manganese dioxide, nickel sulfate, and a control group exposed to deionized water. To assess the effects heavy metals treatments had on a plant's growth, germination rate and plant height were measured and compared between treatments. The results are predicted to show a decrease in height and a delay in germination time between treatments and control. The findings of this study would help establish a correlation between vegetation exposed to water sites contaminated with heavy metals, and the effects this has on their growth and development. This could lead to a better understanding of how water pollution affects the vegetation consumed by humans and how it can result in issues such as food shortages.

Keywords: water pollution, food shortages

17. Effects of Acid Mine Drainage on Diversity of Macroinvertebrates at Morris Creek Watershed

Hailey Cox (Ghent, WV) Jessyka Moore (West Union, WV)

Institution: University of Charleston Field: Sciences (Biology) Faculty Advisor: Heather Arnett

Coal mining has played an important role in the history of West Virginia's economy, but it is also the cause of a major environmental issue called acid mine drainage (AMD). AMD is caused by heavy metals from abandoned mines running into waterways and soils. AMD is a concern because many of the areas affected by AMD flow into larger water sources that are used for drinking and recreation. This is a problem because individuals are unknowingly consuming greater amounts of heavy metals and this can cause kidney dysfunction, nervous system disorders, and vascular damage in humans. The purpose of our study was to determine if AMD affected the diversity and abundance of aquatic insects in the Morris Creek Watershed. Two locations were sampled, an AMD site and a limestone-treated site. Water samples and macroinvertebrates were collected at these locations. Species were identified in both areas, and we used DNA barcoding, to further identify the macroinvertebrates. Ultimately, the diversity and abundance of species was greater at the area treated with limestone. These results indicated that the AMD influences diversity and abundance of species. This is important because the diversity of the environment determines the health of the environment and because diversity boosts productivity. With the results of our study in mind, we propose further research be conducted to examine the best treatment options to combat AMD and to boost environmental diversity.

Key words: DNA barcoding, heavy metals, abundance, environmental disturbance

18. Community structure of Bumble Bees in Kanawha County

Logan Mallory (South Charleston, WV)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Sean Collins

Bumble bees (*Bombus* spp.) are the native social pollinators of North America but many species have been declining for the past 50 years. The goal of our research is to assess the overall diversity of bumble bees in Kanawha County, WV. Bumble bees were collected from a variety of field sites and identified to species in order to establish local population numbers and determine community structure. Our data indicated that the bumble bee community of Kanawha County is dominated (~95% of total specimens) by three species (*Bombus impatiens, B. bimaculatus* and *B. griseocollis*); this pattern is similar to that which has been observed in other regions of Eastern North America. Perhaps most interestingly, the three dominant species all have medium-length tongues, whereas those species that have experienced the most precipitous declines or are least frequently encountered all have either long or short tongues. This may suggest that a shift in hostplant community structure may be at least partially responsible for the loss of bumble bee diversity in this area. This study will undoubtedly contribute to our understanding of the local diversity of these insects, but perhaps more importantly, it will provide valuable data regarding the decline of these pollinators and perhaps yield insights to the locations of refugia where otherwise declining species may occur in higher, more sustainable densities.

Funding: NASA

19. The Aging and Growth of Lepomis in West Virginia

Desirae Ledesma (Dunbar, West Virginia)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Sean Collins

The genus *Lepomis*, includes many species that are important to West Virginia, both as food sources to residents and as important members of native fish communities. Overfishing of *Lepomis* has resulted in a decrease in the larger size classes of many species. This causes smaller fish to become more abundant which in turn breed at smaller sizes and produce smaller broods of smaller and weaker fish. This may result in decreases in overall population size which can then reduce the number of fish that can be eaten by predatory species such as bass, catfish and trout. Not coincidentally, these are often the most sought-after species found in areas where sunfish occur. The goal of our project is to determine whether the size of sunfish is decreasing throughout their range in WV. Data were collected on both overall size and approximate age of collected specimens from several sites in southern WV. These data were compiled and following our analysis, supported our hypothesis that most representative species were not growing at a rate commensurate with their ages. In conclusion, our results suggest there is a need for tighter fishing restrictions when it comes to catching and keeping sunfishes if we wish to preserve the strength of their local populations.

Funding: NASA WV Space Grant Consortium, NSF Louis-Stokes Alliance for Minority Participation (LSAMP) HRD #1826763, and the Title III Part B of the Higher Education Act of 1965
20. *Pleurotus ostreatus* as a Biodetector for Identification of Pharmaceutical Contamination in Surface Water

Maria Irfan (Charleston, WV)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Douglas Bright

Pharmaceuticals are substances used in the diagnosis, treatment, or prevention of disease for restoring, correcting, or modifying organic functions. They can be found in products such as medications, hand and body lotions, and ointments. Over 4000 pharmaceuticals are used across the globe for medical and veterinary healthcare. These pharmaceuticals pass through waste treatment plants and are released into the ecosystem causing harm to wildlife. Mycoremediation is a form of bioremediation that involves the use of naturally occurring biological organisms, such as fungi, to degrade or sequester harmful contaminants in the environment. Oyster mushrooms (Pleurotus ostreatus) are often used to remove contaminants because they have unique characteristics, such as large biomass and tough texture that allow them to act as biosorbents. Pleurotus ostreatus was grown in 10T injectable grow bags containing wood pellets and soy hulls injected with nanogram concentrations of pharmaceutical stock. The mushroom mycelium was also inoculated into small jars containing liquid medium with varying nanogram concentrations of pharmaceutical stock. The fruiting bodies and mycelium of the mushrooms were collected and used in various types of extractions. The samples were tested using NMR to analyze the presence of pharmaceuticals or their metabolites; however, no drugs or metabolites were detected and more sensitive analytical equipment will be necessary. Further analytical testing with instruments such as HPLC and/or LCMS will be conducted to identify the presence of the pharmaceuticals or metabolites and these results will help determine if *Pleurotus ostreatus* can detect pharmaceutical contamination in surface water.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

21. Triple Exposure Assay Trials with Three Pesticides on the Biocontrol Generalist Predator, Green Lacewings, *Chrysoperla rufilabris* Mary Edwards (South Charleston, WV)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Barbara Liedl

Integrated pest management of most crops in protected culture uses biological control agents such as the predator green lacewings, Chrysoperla rufilabris. However little research is available on the effects of pesticides on beneficial insects such as green lacewings. Triple exposure assays have been conducted but only followed development from 2nd instar through to eggs hatching. To investigate effects over more than a generation, a two generation triple exposure assay was planned. Two triple exposure assays were conducted with thirty 2nd instar larvae per treatment with a control and three insecticides applied at the highest rate on the label. Insects were monitored daily for mortality and developmental time points in 2019 and 2021. The pesticides investigated were PyGanic Gardening (2019), PyGanic Specialty (2021), SucraShield, and Oxidate 2.0. Neither experiment was fully carried out due to structural and biological issues, respectively. The developmental time in the first cycle from third instar to pupation was in both years only statistically significant (p > F is 0.0006) for *Pyganic Specialty* and *PyGanic Gardening*. The gender ratio varied from 44% to 53% in both studies but no trends were found between years. In the 2019 study terminated due to water leakage in the cages. The 2021 study was termination due to a lack of fecund eggs laid by adults from any treatment. However, there were also issues starting the colony and collecting eggs to generate the larvae to spray. Trials are suspended until the fertility issues can be addressed.

Funding: US Department of Agriculture, West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

22. Genome Wide Association Study (GWAS) of Dietary Responses to Habanero Pepper Diet in *Drosophila melanogaster*

Amartya Das (Dunbar, West Virginia)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Umesh Reddy

Chili peppers represent an important crop worldwide due to the beneficial properties of their phytochemicals including carotenoids, capsaicinoids, phenolic compounds, vitamins, and minerals. These compounds have been associated with the control of obesity, the reduction in the risk for coronary disorders, diabetes, cancer, osteoporosis, and neurodegenerative diseases. However, focused research in Drosophila has not yet been fully addressed. Thus, this study aims to identify the genes related to the phenotypic responses shown by Drosophila melanogaster after being fed with a habanero pepper diet using GWAS analysis. We used the wild-derived lines from the Drosophila Genetics Reference Panel (DGRP) flies reared on control and 7.5% (w/w) habanero pepper-containing diets. Experiments were initiated by placing approximately 5 males and 5 females onto vials containing the different diets. Adults were allowed to lay eggs for 72 h before being removed. The larvae were fed and once the adult stage was achieved, these flies were selected for bodyweight and triglyceride determination. After obtaining the phenotypic data we performed a GWAS analysis using the easyGWAS platform. In total 54 DGRP genotypes were analyzed and we observed a significant reduction in the body weight and triglyceride content under pepper treatment at both sexes for most of the genotypes. The GWAS analysis identified the top associated genes of habanero pepper response such as CG2246, Oa2, Hsp60C, Snoo, CG11299, CG9850, and Ltd proteins. This study provided a comprehensive understanding of the phenotypic response and the genes underlying pepper diet effects in Drosophila.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

23. Genus Anthobothrium

Abby Baird (Charleston, West Virginia)

Institution: West Virginia State University Field: Sciences (Biology) Faculty Advisor: Timothy Ruhnke

Species of the genus *Anthobothrium* are, with one exception, parasitic is species of carcharhiniform sharks. The current diversity of the genus is eight species, but examination of collected material suggests a much greater diversity. For my SURE research I examined 127 slided specimens from the Gulf of Mexico, Australia, Senegal, and other places from around the world. The objective of my research was to morphologically assess these specimens, group them into study series, and compare them to existing species in order to determine whether they are new to science. Features used for differentiation include aspects of scolex (head) and proglottids (immature and mature) morphology. Comparisons to existing species are still ongoing, but preliminarily, there are six new species of *Anthobothrium* present in the assembled study series.

Funding: NSF Louis-Stokes Alliance for Minority Participation (LSAMP) HRD #1826763

24. Genetically engineered bioenergy cane suppresses microbial activity and reduces soil carbon losses

Jessica Burke (Kearneysville, WV)

Institution: West Virginia University Field: Sciences (Biology) Faculty Advisor: Edward Brzostek

Biofuels have the potential to provide a carbon-neutral fuel source, which would reduce carbon emissions and slow climate change. However, most current bioenergy crops are difficult to convert to fuel. To remedy this, there have been recent efforts to genetically modify crops to produce more oil to allow for easier fuel conversion. Currently, it remains an open question the extent to which the modifications to the plants will alter the activity of microbes that control soil carbon storage. As such, our objective was to determine the extent to which the decomposition and microbial respiration of genetically modified oil cane litter differ from wild-type sugar cane litter. To do this, we incubated stem and leaf litter from wild-type sugar cane and oil cane in jars. We placed the litter in forest soils that differed in their ¹³C isotopic signatures to precisely calculate how much of the litter the soil microbes respired and how much the litter impacted soil carbon losses. After six weeks, our preliminary results show that there are no significant differences in total respiration (i.e., soil + litter) between plant types, but jars with stems had greater respiration than jars with leaves. The results also show that although the microbes are respiring the plant litter types similarly, they are respiring more of the soil carbon in the jars with wild-type litter. This result suggests that oil cane plants may suppress microbial activity, which could increase soil carbon and help mitigate climate change.

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Funding: CABBI

25. From Here to There: Transporter Expression through Tsetse Fly Development Rachel Morris (Charleston, WV)

Institution: West Virginia University Field: Sciences (Biology) Faculty Advisor: Rita Rio

Symbiosis is crucial for survival on nutrient-poor diets. Blood-feeding tsetse flies are the medically significant vectors of African trypanosomiasis. Their obligate symbiont, Wigglesworthia glossinidia, supplies vitamins essential to tsetse reproduction. Through its role in nutrient provisioning, Wigglesworthia impacts vector competence (the ability to maintain and transmit trypanosomes). Transporters mediate host-symbiont interactions, guiding metabolic exchanges. Here, highly expressed tsetse transporters (n=55) were identified within the symbiontcontaining organ (i.e., bacteriome) of two evolutionary distant tsetse species, hypothesizing these transporters as critical towards symbiosis. Further, because Wigglesworthia demands fluctuate through tsetse development, transporter expression should reflect these alterations. To examine transporter expression, RNA was isolated from tsetse life stages, cDNA synthesized, and the expression of transporters—Na⁺/K⁺ ATP synthase alpha and ATPase beta subunits, aquaporin (regulating H₂O distribution) and proton-coupled amino acid transporter-determined. Expected results include observation of differences in transporter expression between tissues (i.e., bacteriome versus gut), and life stages. Understanding the transporter mechanisms driving the tsetse-Wigglesworthia metabolic integration may provide insight to its influence on tsetse biology and novel targets for vector control.

Funding: WVU SURE, KY-WV LSAMP, Henry W. Hurlbutt Memorial Research Award

26. Soil phosphatase activity in a WV soil invaded by *Microstegium vimineum* (Japanese stiltgrass)

Sydney Daniels (Charleston, WV) Autumn Smith (Charleston, WV)

Institution: University of Charleston Field: Sciences (Biology) Faculty Advisor: Aida Jimenez Esquilin

Microstegium vimineum (Japanese stiltgrass) is a highly invasive species that negatively affects native plants and wildlife. This plant is found in highly disturbed fragmented habitats across WV such as in hiking trails, yet its effects in soil phosphorus cycling are poorly understood. We collected soil samples underneath Japanese stiltgrass (after flowering) and 1.5 m away from the plant at a hiking trail in Kanawha State Forest in Charleston, West Virginia. Several soil physicochemical variables were measured along with the activity soil acid phosphatase. We tested the hypothesis that soil under the invasive species would have a higher rate of the enzyme, higher pH, and altered nutritional content and texture compared to the control samples. Japanese stiltgrass leaves were also collected for a litter decomposition study. Both studies are ongoing, but we report that the presence of Japanese stiltgrass increased the soil pH significantly (p<0.01) and resulted in very low soil P. Using a standard assay of phosphatase activity, we did not discover a difference between the soils (p=0.636). Regarding the litter decomposition study, early measurements of CO₂ show that soil respiration decreased in the presence of the litter but soil P slightly increased. Soil phosphatase activity will also be conducted in the litter study to determine if there is a change in activity. We also plan to collect Japanese stiltgrass affected soil in a different area during Spring for another trial. Together, these findings will help us characterize how this invasive plant affects soil P cycling during its growing period.

Funding: National Science Foundation

27. Activation of G protein-coupled estrogen receptor (GPER1) in meningioma cells William Yost (Buffalo, WV)

Institution: West Virginia State University Field: Sciences (Biomedical) Faculty Advisor: Gerald Hankins

Meningiomas and glioblastomas are the two most common central nervous system tumors. Meningioma incidence in women is twice that of men while glioblastoma incidence in men is 1.5 times greater than in women. This indicates steroid sex hormones may play a role in brain tumor development. Evaluating estrogen receptor GPER1 allows for a more thorough understanding of signaling processes in these tumor cells. GPER1 expression can be influenced by selective agonists such as G1 or selective antagonists like G15 and G36. We have currently verified several GPER1 responsive genes such as FOS, HIF1A, HES1 and CCN2 in CH157MN human meningioma cells. Real-Time RT-PCR reactions revealed that G15 has an antagonistic effect on CCN2 (Cellular Communication Network Factor 2) expression, although additional experiments would have to be run to prove definitively. We plan on additional real-time RT-PCR reactions to better understand how G1, G15, and G36 affect GPER1 signaling in human meningioma cells.

Funding: Title III Part B of the Higher Education Act of 1965, West Virginia Science and Research Higher Education Policy Commission

28. Analyzing MitoNEET Protection Against Paraquat-induced Oxidative Stress in *C. Elegans* Aging Models Hanna Jandrain (Martinsburg, WV) Bailey Fedun (Philippi, WV) Sarah Taylor (Athens, WV)

Institution: West Virginia University Field: Health Sciences (Biomedical) Faculty Advisor: Werner Geldenhuys

MitoNEET is an outer-mitochondrial membrane protein integral for mitochondrial function. Mitochondria produce ATP and reactive oxygen species (ROS). Mitochondrial dysfunction can cause over-accumulation of ROS contributing to oxidative stress which, in excess, accelerates neurodegeneration. However, the role of mitoNEET in age-related neurodegeneration is not fully understood. First (D1) and fifth (D5) day adult transgenic mitoNEET knockout, overexpressor, and wild-type Caenorhabditis elegans worms were stressed with paraquat (PQ). We hypothesize mitoNEET overexpressors will protect against oxidative stress while knockouts will reduce protection. Using CellROX green, dihydroethidium, and mitoSOX red fluorescent assays we visualized oxidative stress. Compared to controls, mitoNEET overexpression reduced D1 basal mitoSOX fluorescence (p<0.0001), as well as D1 PQ-challenged CellROX green and dihydroethidium (p<0.01) fluorescences. MitoNEET knockouts showed increases in CellROX green fluorescence in all populations, increased D1 (p<0.0001) and D5 (p<0.05) basal mitoSOX fluorescence, and basal D5 (p<0.001) and PQ treated (p<0.0001) dihydroethidium fluorescences when compared to wild-type populations. These data suggest that mitoNEET overexpression is protective against oxidative stress at early ages while the loss of mitoNEET progressively hinders protection throughout aging.

Funding: National Institutes of Health

29. Modeling of Solar and Wind Power Plants in West Virginia Using System Advisor Model Lillian Bischof (Wheeling, WV)

Institution: West Virginia University Field: Engineering (Chemical Engineering) Faculty Advisor: Fernando Lima

West Virginia is currently highly dependent on fossil fuels for its energy production and consumption. However, the state presents a strong capability for wind and solar energy systems. To continue to expand renewable energy infrastructure in West Virginia, the feasibility of these systems must be studied. This project was conceptualized to study the System Advisor Model's (SAM's) capabilities in modeling renewable energy systems and conducting feasibility studies. In particular, the objective in this project is to model renewable energy generation for solar and wind power plants in West Virginia using SAM to provide a foundation for such feasibility studies.

In this study, six wind energy plants located in West Virginia and one solar energy plant near the border of Maryland and West Virginia are modeled using SAM. Relevant weather information from the NREL Wind Toolkit or the National Solar Radiation Database and plant specifications are used to simulate plant operations in SAM. To check the accuracy of the power generation models, monthly power generations (in MWh) are compared against the Energy Information Administration's (EIA's) reported monthly power generation for each plant, and average monthly errors were calculated. After analyzing SAM models for the wind and solar power plants studied, the results indicate that SAM models produce consistent trends and relatively low errors (23% on average) when compared to EIA real-time monthly energy generation data for a given year. By modeling renewable energy systems with SAM, feasibility of renewable energy systems can be determined with regard to performance and financial considerations.

30. Polymerization of Dicyclopentadiene on Self Assembled Monolayers To Reduce Corrosion In Stainless Steel

Robert Snidow (Princeton, West Virginia)

Institution: Concord University Field: Sciences (Chemistry) Faculty Advisor: Alexander Rupprecht

Corrosion of metals such as stainless steel 316L leads to a loss of integrity of the structure the metal composes. In this project, surface-initiated ring opening metathesis polymerization (SI-ROMP) of polydicylcopentadiene (pDCPD) was performed. 11-hydroxyundecylphosphonic acid (11-HUPA) self-assembled monolayers (SAMs) were attached to 1 cm x 1 cm polished substrates of SS316L by aerosol deposition and then terminally modified by attaching a terminal norbornene functional group to the hydroxyl terminus via esterification with 5-norbornene-2-carbonyl chloride. This was used as an initiator for SI-ROMP of dicyclopentadiene (DCPD) in vapor phase for 30 minutes. Diffuse Reflectance Infrared Fourier transform (DRIFT) spectroscopy, and contact angle analysis were used to characterize the SAM surface after each preparatory stage: deposition, norbornene attachment, and polymerization. The DRIFT spectra indicated successful formation of 11-HUPA SAMs and terminal norbornene attachment with C=O stretching present at 1730 cm⁻¹ and C-O ester stretching at 1250 cm⁻¹. Future work includes attachment of norbornene functional group via steglich esterification and its comparison with 5-norbronene-2-carbonyl chloride solution deposition method, subsequent polymerization of DCPD after steglich esterification, characterization with DRIFT spectroscopy, contact angle analysis, and corrosion resistance of the film will be tested with cyclic voltammetry and electrochemical impedance spectroscopy.

31. Synthesis and Characterization of Lanthanide (III)- Complexes of Benzoic Acid Derivatives

Nikki Hatfield (Williamson, WV) Franki Hatfield (Gilbert, WV)

Institution: Concord University Field: Sciences (Chemistry) Faculty Advisor: Rodney Tigaa

Due to their optical properties, trivalent lanthanide (Ln^{III}) ions can be incorporated into solid state lighting materials for applications in flat panel displays, LEDs, and can even be applied for usage in the petroleum industry. Their emission spectra are line-like as a result of the 4*f* orbitals buried at the core by the filled 5*s* and 5*p* orbitals. Since these emission spectra occur from electronic transitions between *f* orbitals, it is known that Ln^{III} ions have longer emission lifetimes (microseconds to milliseconds). These properties make Ln^{III} ions ideal for imaging and sensing applications.

Benzoic acid is a common organic compound used in the undergraduate laboratory and possesses carbonyl binding groups. Therefore, benzoic acid and its derivatives will have the ability to coordinate and sensitize the emission of Ln^{III} ions, making them ideal for luminescent applications. To this end, we used benzoic acid derivatives to coordinate Ln^{III} ions and further observe their optical properties. The metal complexes were prepared via microwave–assisted synthesis under aqueous conditions. It has been observed, thus far, that the metal-complexes containing benzoic acid, phthalic acid, acetylsalicylic acid, and toluic acid displayed prominent red Eu^{III} emission upon UV excitation. We will discuss both structural and optical data obtained using instrumentation such as UV - Vis absorption, fluorescence, infrared, and NMR spectroscopy, as well as mass spectrometry.

32. Stabilizing Polymers into an Aromatic Conformation

Grace Gallinger (Princeton, WV)

Institution: Concord University Field: Sciences (Chemistry) Faculty Advisor: Alexander Rupprecht

Functionalization of surfaces is a promising technique for controlling surface properties. Self-assembled monolayers, which traditionally a head group consisting of a thiol or an organic acid and long alkyl tail, have been extensively studied as a means for modifying several industrially and biomedically relevant metal oxide surfaces. However, these films can form in an unordered fashion due to multiple possible conformations of the alkyl tail, which results in non-uniform surface properties and lessened stability of monolayers. Here we propose the synthesis of novel, poly-aromatic carboxylic acids which, have limited possible conformation, preventing the formation of unordered monolayers. The poly-aromatic carboxylic acids were synthesized using Suzuki cross-coupling, and the resulting products were characterized with NMR and IR spectroscopy. The Suzuki cross-coupling reaction is the cross-coupling between the organoboronic acid and halides, which allows for the poly-aromatic carboxylic acids to form. Future studies aim to synthesize a full library of poly-aromatic carboxylic acids with various terminal groups for use in forming self-assembled monolayers.

33. Wacker-type Oxidation of Alkenes under Microwave

Joseph Barton (Bluefield, WV)

Institution: Concord University Field: Sciences (Chemistry) Faculty Advisor: Hong Yin

The Wacker oxidation, olefin oxidation with Pd catalysts, and related processes remain one of the most important industrial processes and are widely utilized for the industrial production of acetaldehyde from ethylene. It is also an extremely useful method for the transformation of terminal olefins to methyl ketones. The reaction has been used broadly in organic synthetic applications, as ketones are utilized in a plethora of chemistry procedures. This project focuses on a novel microwave method to improve the efficiency and reduce the cost of Wacker-type Oxidation. The reaction time can be significantly reduced with the employment of microwave heating compared with the traditional heating methods. Wacker oxidation of styrene under microwave was carried out and the reaction exhibited good reactivity. The regioselective formation of desired methyl ketone, acetophenone, was observed as the major product. Instrumental analysis was also conducted to identify the structure of the products. The performance of diverse alkenes under this newly developed microwave condition will be investigated in detail to generalize this method.

34. CUPS: An Atom Efficient and Low Waste Producing Method of Inverse Solid-Phase Peptide Synthesis Sarah Hoard (Sutton, WV) Cameron Kimble (Hurricane, WV)

Institution: Marshall University Field: Sciences (Chemistry) Faculty Advisor: Matthew Hostetler

Peptides are an emerging class of active pharmaceutical ingredients (APIs), capable of exhibiting highly specific and potent biological activities. However, the iterative assembly of peptides by solid-phase peptide synthesis (SPPS) is among the most wasteful and poorly atom economical chemical processes. Therefore, there is a critical need to develop more sustainable and atom-efficient technologies to access this important class of molecules. Efforts in our laboratory have focused on developing a novel method of peptide assembly in the inverse (*N*-to-*C*) direction which does not involve wasteful N^{α} Fmoc protection, the controlled substance piperidine, or explosive and allergenic coupling reagents.

Funding: American Chemical Society

35. The effect of tertiary and secondary alcohols on the fluorescence of uranyl (VI) Lydia Neidlinger (Saint Albans, West Virginia)

Institution: University of Charleston Field: Sciences (Chemistry) Faculty Advisor: Xiaoping Sun

The uranyl (VI) cation $(UO_2^{2^+})$ is a toxic uranium species that has been found contaminating some water systems and exhibits strong fluorescence centered at 510nm. In this study, the uranyl cation's fluorescence was observed in the presence of two alcohols (tertiary butyl alcohol and 2-butanol) in order to determine if the alcohols enhanced or quenched the fluorescence emitted by the uranyl as well as observe the interactions of uranyl with different classes of alcohols. Both alcohols at several concentrations (0.02mM-3M) were mixed with 0.01M uranyl (VI) nitrate hexahydrate in acetone, and the fluorescence spectra were measured using a fluorescence spectrophotometer. The absorption spectra of the uranyl-alcohol samples were also measured using a UV-Vis spectrophotometer in order to further prove the mechanism of the interaction. From this study, it was found that both alcohols at very low concentrations enhanced the fluorescence of the uranyl, but as the concentration of alcohol increased, the fluorescence of uranyl was actually quenched via outer sphere charge transfer. This discovery can be used to develop a more sophisticated and effective method of detecting uranyl (VI) in the environment by fluorescence spectroscopy.

36. An Improved Method of Synthesis 2,3,4-tri-O-Acylglucose Esters

Zhifang Xie (Buffalo, West Virginia)

Institution: West Virginia State University Field: Sciences (Chemistry) Faculty Advisor: Micheal Fultz

An improved method of synthesis 2,3,4-tri-O-acylglucose esters was developed. There were total five steps of synthesis route. The starting material was D-glucose. First step is to protect the primary alcohol with Tert-butyldiphenylsilyl chloride, get 103.2% yield (trace pyridine impurities). The second step was protecting the anomeric carbon with phenyl thiol and 2-Chloro-1,3dimethylimidazolinium Chloride in solvent acetonitrile-water mixture (99.5% yield). Third step was esterified with isobutyryl chloride (53.2% yield). Then deprotect the primary alcohol with hydrogen fluoride buffered with pyridine (85.0% yield), the last step was to deprotect the anomeric carbon using N-Bromosuccinimide (85.0% yield). Overall get 4.95g and 15% recover yield.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

37. Activating Biochar for Removing High Concentrations of Heavy Metal from Solution Devin Danford (Hurricane, WV)

Institution: West Virginia State University Field: Business (Chemistry) Faculty Advisor: Amir Hass

Water quality of West Virginia is impaired by a legacy of on-going mining activities, with elevated levels of heavy metals being the main pollutants of interest. In this study, using batch sorption assays, we evaluated the use of activated biochar, a high surface-area charcoal-like material, as a sorbent for removal of copper, lead, nickel, selenium, cadmium, and zinc. Initially biochar showed limited removal potential. Modifying the activated biochar with organic compounds known to have high affinity to metals (i.e. chitosan, and poly-diallyldimethylammonium chloride [PDDA]) we markedly improved biochar removal efficiency. The chitosan-modified biochar removed 83% selenate, but none of the selenite; more than double the removal of copper (89%), but had no effect on the removal of cadmium (100%) removal. These findings show that selected biochar modification can be engineered and tailored for removal of specific metals of interest.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

38. Rare Earth Elements: Critical Mineral Resources of the United States

Ajeet Barana (Charleston, WV)

Institution: West Virginia State University Field: Sciences (Chemistry) Faculty Advisor: Amir Hass

REE are a set of seventeen metallic elements. They are crucial for production of clean energy, batteries, electric vehicles, electronics, military equipment and more. Their magnetic, conductive and luminescent properties make them essential. Production of REE's from mining through to manufacturing is dominated by China (About 95%). Their availability can be influenced by many factors such as social constraints, politics, laws, environmental regulations, land-use restrictions, economics, and infrastructure. The U.S. Commerce Department recommended in June 2019 the United States take urgent steps to boost domestic rare earth production and The U.S. Defense Department is also seeking federal funds to increase domestic rare earth production. In this study we evaluated spent quarry fines as potential feed-source for REE recovery. Samples were collected from different quarry locations throughout West Virginia, Virginia, Georgia, and Kentucky, representing different geology rock formations and mineralogy. The spent fines were evaluated for its particle size distribution. A subsample was then dissolved using strong acids in microwave-assisted digestion system prior to analytical analysis to determine REE and other critical metal content in the material. Results are presented and discussed as use of these quarry waste material for subsequent recovery of critical elements.

Funding: West Virginia Science and Research Higher Education Policy Commission/ Title III Part B of the Higher Education Act of 1965

39. Site-Selective Nickel-Catalyzed Nitration of 8-Benzamidoquinoline

Jacob Smothers (Morgantown, WV)

Institution: West Virginia University Field: Sciences (Chemistry) Faculty Advisor: Jessica Hoover

C-H nitration, the direct conversion of a C-H bond into a C-N bond, is an important technique that allows for more efficient synthesis of target compounds than traditional methods which rely on the use of both nitric acid and sulfuric acid. Due to the presence of many C-H bonds available for functionalization, these methods lead to mixtures and can be ineffective for producing specific forms of a compound in high yields. Because site-selective C-H functionalization has implications for pharmaceutical and material sciences, this study attempts to develop a deeper understanding of selectivity in such functionalization reactions by using nickel as a model catalyst. The synthesis of a number of pharmaceuticals (omeprazole, sulfonamides, retigabine, etc.) depends on selective methods for preparing nitrated products. The need for nitrated products is even more widespread in light of the ready reduction of nitrated compounds to amines. Catalytic systems have the potential to allow for milder conditions and are anticipated to offer a greater ability to produce one specific isomer in relatively high yield. In this study the nickel-catalyzed nitration of 8-benzamidoquinoline is used to examine the role of different nickel sources in the selective C-H nitration of 8-aminoquinoline derivatives. From this study, nickel(II) chloride hexahydrate has been identified as the optimal catalyst for the nitration of 8-benzamidoquinoline with an overall yield of 91% and a selectivity of 4:1. Therefore, it appears that nickel is a good candidate for the site-selective nitration of 8-aminoquinoline derivatives, and further experimentation will help to fully explain this selectivity.

Funding:National Institutes of Health

40. The Impact of Mental Health Awareness on Collegiate Athletes

Sydney Philpott (Athens, WV)

Institution: Concord University Field: Health Sciences (Community Health) Faculty Advisor: Laura Wamsley

Mental health is recognized as an important topic in the world today. Mental health includes our social, emotional and psychological wellbeing. A person's mental health plays a part in how we usually manage the stress we put on our bodies. As we begin to learn the importance of how we manage our mental health especially in times in which we live, it has never been as important as it is today. As we engage and involve ourselves in the world around us, the importance of physical and mental/emotional health has never been as important topic of discussion as it is now. However, as previously discussed before, the mental health crisis that is effecting our nation currently is something that must be addressed.

College athletes have expectations and stresses that can affect their mental health. This research specifically focuses on the stigmas of mental health in the athletic population. It addresses and discusses how stigmas affect athletes, specifically, in obtaining mental health resources and/or treatment. The question addressed is "Do collegiate athletes avoid seeking mental health services based on stigmas or preconceived thoughts?" While addressing those stigmas and preconceived thoughts, this study seeks to determine if stigmas or preconceived thoughts affects collegiate athletes in their decision whether to seek mental health services.

41. Hard Knock Life for Us: Poverty and Chronic Health Conditions

Makayla Anderson (Beckley, WV)

Institution: West Virginia University Field: Health Sciences (Community Health) Faculty Advisor: Julie Patrick

Purpose: Chronic health conditions (CHC) are associated with aging, and most older adults have at least one. Likewise, poor health relating to low income is believed to play a role in developing CHCs. This study examines whether adults in WV experiencing financial hardship have a higher prevalence of developing CHCs earlier in age than average, and whether this affects mental health.

Methods: Logistic regressions and cross tabulations using the WEAT tool were performed using 2021 BRFSS data. WV adults (ages 18-64) and older adults (65+), along with income and gender, were compared to 7 CHCs: kidney disease, arthritis, COPD, stroke, angina, myocardial infarction, and cancer. Having a CHC and low income was also compared to the reported number of poor mental health days.

Results: Males and females ages 18-44 making <\$10,000 annually have a 72% chance and 46% chance, respectively, of having a CHC. Conversely, chances of males and females ages 18-44 making \$50,000 developing a CHC before the age 65 is 20% and 17%, respectively. A correlation was also found between poor mental health days with the number of CHCs and income (p<0.001).

Discussion: A significant correlation between income and CHCs in adults was found. Adults (male and female) with low incomes are assumed to develop a CHC before reaching the age of 65. Income and number of CHCs also uniquely predicts the number of poor mental health days, but a stronger effect is seen for those with low income.

42. The Impact of Race and Sex on Access to Healthcare

Collin Lloyd (Cincinnati, WV)

Institution: West Virginia University Field: Social Sciences (Community Health) Faculty Advisor: Julie Patrick

Purpose: Social determinants of health, such as sex and race, play a part in the well-being of aging adults in Appalachia (Hege, 2018). This study examines how one's race and sex puts them at a disadvantage when it comes to access to healthcare and could even lead to an early grave.

Methods: Using 2015-2018 BRFSS data, a logistic regression was used to examine the relations among race and sex for aging adults in Appalachia. The study uses a sample size of 5,665 West Virginia residents with 2,474 of the population being men and 3,191 being women.

Results: Age, sex, and race to predict Health Care Access was significant, F (11, 5665) = 54.93, p < .001. Age, sex, and race were each predictors, although there were no interactions. However, these differences do not seem to compound. The population included 5,349 white and 316 nonwhite respondents. As the population of West Virginia ages, whites on average had a higher mean (better access to healthcare). The data also shows that women on average have better access to healthcare, but this statistic is skewed due to the population of women being greater than the population of men by 717.

Discussion/Conclusions: While this study is in no way degrading the work to improve the state's overall access to healthcare, the difference that is present when race and sex variables come into play show that there is room for growth. This study provides a representation of the inequality of healthcare access across aging adults in Appalachia.

43. Satisfaction with access to health services in West Virginia during COVID-19

Nathaniel Palmer (Clarksburg, WV)

Institution: West Virginia University Field: Health Sciences (Community Health) Faculty Advisor: Trisha Petitte

Introduction: A literature review of 12 articles revealed that COVID-19 impacts health services for patients with heart failure (HF). This study was conducted on participants who enrolled in a (HF) clinical trial on palliative care coaching for patients and family caregivers in rural Appalachia.

Hypothesis: COVID-19 impacts HF patients and their caregivers' (1) quality of life (QoL) and health satisfaction, and (2) access to health care and community services.

Methods: A descriptive study conducted between August 2020 to March 2021, using a structured telephone survey with open-ended questions.

Results: Thirteen participants enrolled in the study. On a scale of 1-5, patients were satisfied with their QoL (3.83 (SD=1.17), but half of caregivers reported average and poor QoL (Mean = 3.17 (SD=0.98). However, 70% of caregivers were satisfied with their health (Mean=3.71 (SD=1.25), while half the patients reported neutral satisfaction or dissatisfaction with their health (Mean=3.17 (SD=0.98).

Half the patients reported phone calls and 33% had telehealth appointments. Patients reported calling (83%) and receiving calls (67%) from doctors or nurses to discuss health issues, labs and medications issues.

A few participants (15%) used community services. About 70% of participants reported sufficient healthcare, while one-third (30%) did not and reported difficulty getting medications and rescheduling appointments.

Conclusions: COVID-19 has an impact on QoL and health of patients with HF and their family caregivers. Families need care coordination from healthcare providers to maintain HF home care. This includes help with their prescriptions, monitoring and managing symptoms, scheduling appointments, and preventing unwarranted hospitalizations.

Funding: National Institutes of Health

44. Diabetes is a stronger predictor of cognitive difficulties than age

Faraz Shere (Charleston, WV)

Institution: West Virginia University Field: Health Sciences (Community Health) Faculty Advisor: Bernard Schreurs

As the rate of cognitive difficulties increases in the US (Ganguli et al. 2020), more research is needed to examine physiological factors contributing to the condition. According to the CDC, WV has the highest rate of diabetes in the US. Older West Virginians are at an increased risk for cognitive difficulties due to the high prevalence of diabetes and the increased risk factors associated with age (Wessels et al. 2011; Chew et al. 2013). This research examines if various factors predict cognitive difficulties in older West Virginians.

Using data from the CDC's 2020 Behavioral Risk Factor Surveillance System, we used a logistic regression to predict cognitive difficulties in 5880 WV adults with age, gender, and diabetes status as predictors.

The omnibus test was significant χ^2 (3, 5880) = 60.94, p < .001. The odds ratio showed that younger and older adults were about as likely to report cognitive difficulties (OR = 0.99), women were 1.22 times more likely to report cognitive difficulties, and those with diabetes were 1.91 times more likely to report cognitive difficulties.

Age, gender, and diabetes status can predict cognitive difficulties in West Virginians. Advocating for a healthier lifestyle for West Virginians can help reduce risk of cognitive difficulties. There are barriers when it comes to West Virginians' access to healthy food and places to exercise, but future research can provide ways to combat these inequities.

Funding: National Institute on Aging (NIA)

45. Topography and Rainfall Predict Reginal River Output

Melinda Goda (Athens, West Virginia)

Institution: Concord University Field: Sciences (Computer Science) Faculty Advisor: Aaron Paget

Whether it is a hill or hollow, mountain or valley, defining how water flows downhill helps to predict river flow and flooding. This study mathematically identifies the direction that water flows using topographic data from the 2021 GEBCO (General Bathymetric Chart of the Oceans) 0.5 km gridded dataset. Building a down-slope model using high resolution topographic data requires a computationally intensive approach to identify the highly-variable, state-wide down-slope directions using a multivector approach and 2-dimentional gradients. My efforts in developing a computational model of the downslope direction are presented. This model in combination with regional precipitation data provides the foundation for a waterflow model of the expected surface water flow in West Virginia and surrounding areas. This down-slope model approach helps to identify flood plains, expected river water levels and output, and ground absorption of surface water. Additional model applications include predicting regional water tables and water availability for wells and other freshwater sources.

46. A Lightweight Authentication Protocol for IoD Based on Bilinear Pairing and Physical Unclonable Function

Andrew Wall (Scott Depot, WV)

Institution: Marshall University Field: Technology (Computer Science) Faculty Advisor: Cong Pu

As drones become a more popular tool for a variety of tasks, there is a growing focus on the Internet of Drones (IoD) and IoD communications. Secure communication between drones and Zone Service Providers (ZSPs) has become essential for IoD environments. Due to the limited resources available to drones and the insecure wireless communication channels, traditional security protocols cannot be applied directly in the IoD environments. This has led to the need for a lightweight authentication protocol for use in the IoD environments. In this project, we propose a lightweight authentication protocol (hereafter referred to as liteCrypto) that uses bilinear pairing and physical unclonable function to protect the communication in the IoD environment. In the liteCrypto, the drone will authenticate with the ZSP using bilinear pairing and physical unclonable function to establish a secure session key before sharing any sensitive information over an insecure wireless channel. Here, a physical unclonable function (PUF) is defined as a function that maps an input to an output based on the complex physical randomness of an integrated circuit. Due to the slight physical variations of integrated circuits, PUFs can use these variations as a form of unique identification, like a fingerprint for a human. In addition, Bilinear pairing allows two entities to encrypt messages without needing to verify a key in advance, using the entities' identity to generate a public key. To evaluate the performance and security of liteCrypto, we plan to conduct extensive experiments on the real-world testbed.

Funding: Marshall University NASA Space Grant Advisory Committee

47. Sentiment Analysis of Track and Field and Soccer in English and Spanish during COVID-19

Patricia Alonso Munoz (Charleston, WV)

Institution: University of Charleston Field: Sciences (Computer Science) Faculty Advisor: Vincent Smith

This research will analyze tweets about soccer and track and field with respect to sentiment in both Spanish and English during the COVID-19 pandemic. Data was collected through text in posts on Twitter and will be analyzed by using packages in R. The purpose of research is to understand the possible appreciation or frustration associated with sporting events during a difficult period. COVID-19 is known for impacting a lot of people; however, few researchers consider how it impacts sporting events. (Research on progress, results to be determined by the end of 2021). The research was approved by UC's IRB: IRB Approval: 21-0043.

48. 3D Reconstruction with Deep Learning

Zackery Toler (Canvas, WV)

Institution: West Virginia State University Field: Sciences (Computer Science) Faculty Advisor: Fred Wu

The goal of image-based 3D reconstruction is to infer the 3D geometry and structure of objects and scenes from one or multiple 2D images. 3D reconstruction is of general scientific interest and forms part of core technologies used in a wide range of problems. More specifically, it has applications in Computer Graphics, Computer Vision, Medical Imaging, Virtual/Augmented Reality (VR/AR), Geology and many other scientific fields. In this project, we will build a 3D reconstruction with deep leaning. We will use Convolutional Neural Networks(CNN), Long-Short Term Memory (LSTM) of Recurrent Neural Networks(RNN) and Generative Adversarial Neural Networks (GAN) to reconstruct a 3D image from multiply 2D images. We will train a neural network model with hypercolumn features to predict implicit surface representations for points in a brain template space. After training, the cortical surface at a desired level of detail is obtained by evaluating surface representations at specific coordinates, and subsequently applying a topology correction algorithm and an isosurface extraction method. We apply the secure SR images generated from the deep learning method to perform 3D reconstruction. An advanced ray casting 3D reconstruction algorithm that can reduce the number of rays by selecting the appropriate bounding box is proposed. Due to the relatively large size of the project, we will not be able to complete it in February 2022, but we plan to complete the construction of the system and the first phase of training, which will enable the preliminary three-dimensional construction of a single 2D image.

Funding: WV Innovation Grant and the Title III Part B of the Higher Education Act of 1965

49. Denoising with Generative Adversarial Networks for 3D Reconstructio

Dalton Lucas (Milton, WV)

Institution: West Virginia State University Field: Sciences (Computer Science) Faculty Advisor: Fred Wu

The goal of image-based 3D reconstruction is to infer the 3D geometry and structure of objects and scenes from one or multiple 2D images. 3D reconstruction is of general scientific interest and forms part of core technologies used in a wide range of problems. More specifically, it has applications in Computer Graphics, Computer Vision, Medical Imaging, Virtual/Augmented Reality (VR/AR), However 3D reconstruction needs Superresolution (SR) image. This project will generate SR images using Generative Adversarial Networks(GAN). Firstly, a generativeadversarial network structure based on residual blocks was designed. Secondly, a refined loss function was given to train the GAN network. The well designed loss function can help the generated image to be very close to the clear counterpart while enhancing more details in colours and brightness. This work proposes an end-to-end model for image denoising using cycleconsistent adversarial networks. The main novelty of this work is to achieve blind image denosing, i.e., denosioing without knowledge of the noise kernel. Our method, named "Denosing CycleGAN," generates a sharp image from a blurry one and shows how cycle-consistent generative adversarial networks (CycleGAN) can be used in image denosing. Using only a blurred image as input, we try to generate the sharp image. Thus, no information about the noisekernel is required. In the evaluation part, we use peak signal to noise ratio (PSNR) and structural similarity index (SSIM) to compare the denoising images. The experiments demonstrate a clear improvement in visual quality with respect to the state-of-the-art using a dataset of images.

Funding: WV Innovation Grant

50. Flora Beginnings

Madison Hess (Bridgeport, WV)

Institution: West Virginia University Field: Creative Arts (Creative Arts) Faculty Advisor: Angela Uriyo

Flora is defined as a plant from a region, habitat, or geological period. In my design, this relates not only to botanical prints and leaves, but also the influence from one era such as the '20s to another, the '30s. Beginnings represents start of new things, such as the act of incorporating the laser cutter and block printing for the first time in my design work. My client, who reflects simplicity with a twist, needed a garment that was comfortable, unique, and drew inspiration from her favorite eras - '20s and '30s. Thus, the purpose of my project was to design a dress to fulfill my client's needs, using historical references from the '20s and '30s like the handkerchief hem and head scarf, and displaying applications of new technology and hints of traditional handcraft in my overall design approach. The grey printed chiffon leaf appliques that wrap around the dress are an important visual element. Hand block printing the grey chiffon with a blue ink adds dimension and a layer of interest to the ensemble. To ensure the ends of the chiffon appliques would not fray I decided to laser cut each individual leaf applique after block printing the fabric. The results were sharp edges that allowed me to sew the appliques organically onto the dress. I used the selvages on the remaining grey chiffon fabric in various scales as trim on the sleeve and dress hems. Having chiffon trim on the bell sleeves gave the dress texture.





51. The Mod Revival

Peyton Burford (Hurricane, WV)

Institution: West Virginia University Field: Creative Arts (Creative Arts) Faculty Advisor: Angela Uriyo

"Baby boomers hold \$2.6 trillion in buying power. They're credited as one of the wealthiest generations to date and are still economically powerful despite their old age" (Lexington Law, 2021). Our target customer is a Baby Boomer, who we interviewed at length to gain insight on what her clothing wants, and needs were. We discovered her challenges were based on clothing fit and the lack of available garment silhouettes that flatter her ageing body. The purpose of this project was to a design and construct a garment that would address these problems. Our interview data indicated that her favorite fashion era was the '60s, so that is where we drew our design inspiration from. After conducting further research on what designers, styles, garment fit, and colors in the '60s were popular, *Revived Mod* was the outcome. This design pulls from one of the most popular styles from the '60s and incorporates modernity without losing the elements that make Mod distinct. The dress silhouette gives the illusion of being form-fitting, but the use of fisheye darts guarantees a more comfortable fit. Side panels under the pockets lend a slimming effect, and feature a block printed pattern for a handcraft element. The pockets are purposefully large since our customer complained that the size of the pockets on her garments are usually too small. Lastly, we incorporated bell sleeves to further reflect the '60s inspiration.



Lexington Law. (2021, February 08). Baby boomer spending habits in 2021. Retrieved November 12, 2021, from <u>https://www.lexingtonlaw.com/blog/credit-cards/baby-boomer-spending-habits.html</u>

52. The Effects of Different Operator Chairs on Dental Professional Back Pain and Ergonomics Kelsie Bishop (Morgantown, WV)

Madelyn White (Morgantown, WV)

Institution: West Virginia University Field: Health Sciences (Dental Hygiene) Faculty Advisor: Ashlee Sowards

Intro: Back and neck pain are common issues that many dental professionals suffer from. This pain is believed to be related to the type of dental chair used which affects the operator's positioning and ergonomics. Research is needed to determine which chair is best at alleviating this discomfort.

Purpose: The purpose of this study is to gain knowledge on the use of different dental operating chairs in the dental hygiene profession and their relation to back pain and pain.

Methods: Consent forms for participation and pre-surveys were completed by dental hygiene students at the WVU SoD to assess their initial pain level after completing an appointment. Students then completed a post-survey for each operator chair to assess a difference in pain levels. Surveys were de-identified to prevent bias and data was transferred to Microsoft Excel for evaluation. Descriptive statistics were used to analyze response from participants.

Results: With 69 post surveys completed, 54% noticed a difference in pain with chair A, 93% with chair B, and 33% with chair C. The chair design of chair B led to a greater number of people preferring this chair and noted a positive change in their posture and seating.

Conclusion: Confirming our hypothesis, students who used Chair B felt more comfortable compared to other operator chairs. A majority of participants noticed a change in pain after using this chair and said that they were self-aware of their seating and positioning. Chair B was the most successful at alleviating operator pain after an appointment.

53. Efficacy of Plastic Protective Barriers vs. Disinfectant Wipes

Tatiyana Caesar (French Creek, WV) Abigail Charles (Fairmont, WV)

Institution: West Virginia University Field: Health Sciences (Dental Hygiene) Faculty Advisor: Alicinda Shockey

Purpose: The purpose of this study was to determine the effectiveness of plastic barriers and disinfectant wipes.

Methods: Five bacterial swabs per patient (n=10) using plastic protective barriers and 4 bacterial swabs per patient (n=10) not using plastic protective barriers on the air/water tip for 20 participants. Swabs soaked in 0.85% sterile saline were used. Swab head was placed into a 2mL conical-tube containing 1mL 0.85% sterile saline solution. Tubes were vortexed for 15 seconds at a speed setting of 2500 rpm and sonicated in 37°C water bath for 2 minutes. 0.1mL of serially diluted samples were placed onto Blood Agar plates. L-spreader was used uniform coverage inoculation. All samples were duplicated for total viable counts (TVC). Inoculated plates were incubated at 37°C in air containing 5% carbon dioxide for 72 hours where colony-forming units (CFUs) on each plate were enumerated. CFU can be calculated using Miles and Misra method.

Results: Swab 1 averaged 90 more CFU/ml found in the non-barrier group compared to 50 more CFU/mL in group 2, the 20m more CFU/mL in group 3 and the 60 more CFU/mL for group 4. Swab 5 was not compared.

Conclusion: The protective barriers are beneficial in certain locations, but the data does not confirm protective barriers are more beneficial than non-protective barriers.

Funding: West Virginia University

54. Use of Disposables in the WVU School of Dentistry

Natalie Clingan (Harpers Ferry, West Virginia) Rursch Makennah (Morgantown, West Virginia)

Institution: West Virginia University Field: Health Sciences (Dental Hygiene) Faculty Advisor: Alcinda Shockey

Introduction: Single use disposables are a necessity in dentistry and cannot be avoided. However, most dental students are unaware of how many gloves and disposables are being used throughout each appointment.

Purpose: The purpose of this study was to determine the amount of single use disposables utilized by a dental student during a single dental appointment.

Methods: A form was created to record the number of disposables used during each appointment. A total of 20 appointments, consisting of third- and fourth-year dental students, were observed to determine the average number of disposables utilized in each appointment. The appointments varied in length and procedure, but data was collected from the start to the end of each procedure.

Results: Approximately 13 pairs of gloves were used during each appointment and an average of 10 single use disposables were used in the dental unit as plastic barriers. The average amount of gloves used in each appointment was 7 for the operator, 3 for the assistant, and 3 for faculty. A total of 13 appointments where dental students were utilizing dental assistants were observed. The operator used approximately 7 pairs of gloves with an assistant. Without an assistant the average was 5 pairs of gloves during an appointment.

Conclusion: Our first hypothesis was correct. Dental students on average, used more pairs of gloves in an appointment than single use plastics. Contrary to our second hypothesis, as seen in the date mentioned previously, dental students used more gloves with an assistant than without.

55. Professional Grade Carbamide Peroxide for at Home Bleach Trays vs. at Home Bleaching Remedies

Baylee Fitzwater (Morgantown, WV) Kaci Zopp (Morgantown, WV)

Institution: West Virginia University Field: Sciences (Dental Hygiene) Faculty Advisor: Alcinda Shockey

Introduction: Whiter teeth has become more desirable, causing many at home remedies to surface on the internet. This study looked at the professional grade carbamide peroxide compared to athome remedies utilizing household products.

Purpose: This study compared professionally prescribed bleaching treatments to the effectiveness of at-home remedies.

Method: Thirty enamel blocks were soaked in wine for one week and coffee for an additional week. Enamel block shades were documented after each week of staining was completed. After the enamel block shades were recorded at their darkest shade, bleaching treatments began. Five different whitening groups with six enamel blocks in each group; control, carbamide peroxide, coconut oil, baking soda mix and hydrogen peroxide. Bleaching treatment to each group was conducted twice a day (carbamide peroxide and coconut oil once a day) for one week. The final shade of each enamel block was recorded using the Delta E equation for an average shade range. This allowed determination of which group was most effective in shade lightening after staining.

Results: The carbamide peroxide group had the highest average, therefore it was the most effective treatment. The two other groups that were closet to carbamide peroxide were the baking soda mix and hydrogen peroxide. The coconut oil group had the lowest average; therefore, the least effective treatment.

Conclusions: The study revealed that professional grade carbamide peroxide with at-home bleach trays are more effective than at home remedies. However, the at-home remedies did lighten the shade but were not as effective as professionally administered bleach.

Funding: West Virginia University
56. A Study to Determine Dental Hygienists' Comfortability to Assess Eating Disorders in West Virginia Hannah Grimm (Smithfield, Pennsylvania)

Lauren Bane

Institution: West Virginia University Field: Other (Dental Hygiene) Faculty Advisor: Alcinda Shockey

Introduction: Dental hygienists in West Virginia do not feel adequately trained to counsel patients diagnosed with eating disorders and are not confident in identifying oral manifestations.

Purpose: The purpose of this study is to determine if dental hygienists in West Virginia are comfortable identifying oral manifestations associated with eating disorders along with counseling patients who may suffer from bulimia nervosa, anorexia, and binge eating disorders.

Method: A 13-question survey aimed to determine the comfortability of assessing eating disorders was distributed to 60 dental hygienists in West Virginia using the online survey platform, RedCap. The survey was available for two weeks and data was assessed using the Likert scale.

Results: Out of 60 participants, 41 responded to the survey, which makes the response rate 68%. 58% of clinicians are not confident in their ability to counsel their patient on a possible eating disorder. 54% of clinicians are confident in identifying oral manifestations. 81% of participants agree that there should be more of a focus about eating disorders in the dental hygiene curriculum. 81% of clinicians are also comfortable in identifying glossitis, candidiasis, enamel erosion, and angular cheilitis.

Conclusions: Dental hygienists in West Virginia are confident in identifying oral manifestations of eating disorders in their patients; but are not confident in their ability to counsel. The dental hygiene curriculum should emphasize eating disorders since dental professionals can be the first line of defense in eating disorder prognosis.

57. A Study of the Ergonomics of Dental Hygiene

Emma Rice (Point Pleasant, West Virginia) Caylie Simmons (Franklin, West Virginia) Madylin Hinkle (Morgantown, West Virginia)

Institution: West Virginia University Field: Health Sciences (Dental Hygiene) Faculty Advisor: Alcinda Shockey

Intro: Proper ergonomics can help reduce work-related pain among the dental hygiene profession including eye strain and wrist, neck, and back pain. Knowledge of work-related pain throughout West Virginia provides opportunities for education to prevent poor ergonomics.

Purpose: The purpose was to identify the most contributing factors and prevalence of specific types of pain within the dental hygiene profession and using demographics to express pain tendencies. The first hypothesis was that wrist pain is most prevalent and the second is the highest contributing factor to poor ergonomics is frequent use of dull, hand instruments.

Methods: 68 dental offices employing dental hygienists were sent a survey using REDCap. The survey consisted of 20 questions. The survey was open for three and a half weeks and at the three-week interval. Survey questions included participant demographics, presence of pain, and instrument maintenance. Responses were correlated using a Chi Squared Test.

Results: The average pain reported was 3.926 out of 10. 20 dental hygienists reported neck pain, 13 reported wrist pain, 16 reported back pain, and 11 reported eye strain. 81.8% reported using hand instrumentation daily. 37% of hand instrument users report regular sharpening of instruments. 70% of respondents with neck or back pain reported sitting during an appointment.

Conclusion: The most prevalent type of pain was neck pain. There is a strong correlation between respondents who reported using hand instruments that are not frequently sharpened and wrist pain. The first hypothesis was rejected and the second hypothesis was strongly supported.

58. The Link Between Different Dental Products and Enamel Crystallization

Catlyn Sparks (Buckeye, WV) Kandice Pruitt (Panther, WV)

Institution: West Virginia University Field: Health Sciences (Dental Hygiene) Faculty Advisor: Alcinda Shockey

Introduction: Dental incipient lesions are the first stage of a carious lesion prior to restoration. Fluoride is used to slow the rate of progression through remineralization. Fluoride is much cheaper than restoration and is an effective treatment in the progression of dental decay.

Purpose: Determine which product provides the most fluoride crystallization of the enamel, along with determining if hydroxyapatite effects enamel crystallization. Also, indicate which fluoride product works the fastest as designated with manufacture suggestion.

Methods: Twelve 10X10 enamel blocks created from #28 teeth, placed in resin. Teeth were cleaned with pumice. Enamel blocks underwent Scanning Electron Microscopy (SEM) for an elemental analysis. Blocks were demineralized with 5% Nitric Acid for 1 hour prior to second SEM analysis. Four groups were utilized for remineralization. Control (Teeth 1-3), PreviDent Booster Pluss 5000 (Teeth 4-6), RemiPro (Teeth 7-9), MI Paste (Teeth 10-12). Products applied for 7 days per manufacturer. After remineralization, a final round of SEM was completed.

Results: An increase in overall fluoride from initial SEM scanning to remineralization phase. SEM imaging shows changes in the overall surface area of the tooth from demineralization to remineralization. Elemental analysis showed changes in all elements but mostly calcium, photophores and fluoride.

Conclusion: Our hypothesis was strongly supported. There is a correlation between applying fluoride to a demineralized area and showing changes in the enamel as see on the SEM images. All products indicated changed on the surface area. Based on product containing hydroxyapatite in addition to fluoride showed the most surface changes.

Funding: West Virginia University

59. WONDERLIFT

Gregory Panther (Beckley, WV) Jacob Cross (Beckley, WV)

Institution: West Virginia University Institute of Technology Field: Engineering (Engineering) Faculty Advisor: Winnie Fu

Current market products include pickup truck liftgates that are very expensive, upward of \$2000-\$3000, and contain electrical components prone to failing. These market products are also large and often require modification of the pickup truck or its tailgate. These four disadvantages of current products bring fourth the need for a smaller scale, yet impactful design. This product design is intended to create a product that is more affordable to individual consumers and small business owners. Our design includes the same capabilities of current market liftgates, but smaller and cheaper. The design will feature a lift method capable of lifting/lowering 800-1000 lbs. The product will be able to raise to a level to reach any pickup truck tailgate. The cost of our product will cost a fraction of that of current market designs. Our current design includes four subsystems. Wheel, Frame, Jack, and Lifting plate are being designed via hand calculations and through 3D modeling software such as SolidWorks. Analysis to check for strength and safety are planned based on chosen material for cost requirements.

60. Tiny 'Green' Houses: Sustainable Energy Water Pumping System for Small-Scale Living

Ashton Graley (Poca, West Virginia) Wesley Helmandollar (Beckley, West Virginia)

Institution: West Virginia University Institute of Technology Field: Engineering (Engineering) Faculty Advisor: Winnie Fu

Renewable energy is an ever-evolving frontier in modern industry. In recent years, new designs have been brought forth to lessen the impact that industry has had on the environment. A popular way this has been occurring is to re-engineer existing designs to be run using renewable sources such as wind, solar, and hydropower. With the trend of downsizing to tiny homes and RV's, sustainable water and power sources for these living spaces is needful. Utilizing green energy to power these small homes would allow for greater freedom concerning finances and location. Without the need to rely on available site power and water sources, owners of RV's and tiny homes would be free to live and park virtually anywhere as long as there was a water source nearby.

Our main objectives for this preliminary research into power sources, water pumps, and water purification will be selecting and acquiring a hydraulic pump based on budgetary constraints and fluid output needs, design power circuit using solar panel and wind turbine as inputs and a large battery and the fluid pump as outputs, design water purifying device to filter large and small scale particles as well as eliminate contaminants without restricting water flow, assemble and test the system, communicate all design and findings in a technical report, and finally evaluate future designs and recommendations.

Scope of our work to meet these objectives: To execute this design, the team will need an extensive understanding of fluid mechanics coupled with a basic understanding of energy systems and electrical circuits. Additionally, an understanding of EPA drinking water standards and how to filter water to this standard is necessary. The team will need to utilize basic fabrication techniques and execute thorough communication in reports and presentations.

Measures of success for our project is as follows:

- Water quality after passing through pumping system is within EPA drinking water regulations
- The pump can produce at least 17 gallons of purified water a day
- The power circuit (wind and solar) produces 100-400 Watts of power
- The system remains within budgetary constraints

Our group hopes that we will be selected to be a participant of The Nineteenth Annual Undergraduate Research Day at the Capitol and represent both West Virginia University Institute of Technology and the state of West Virginia.

61. The Automatic Spotting System: A Safety Device to Prevent Weightlifting Related Injuries

Elijah Buckland (Fayetteville, WV) Brenna Emery (Beckley, WV)

Institution: West Virginia University Institute of Technology Field: Engineering (Engineering) Faculty Advisor: Winnie Fu

Performing compound barbell movements, such as the squat or bench press, can expose athletes to the risk of injuries. Current methods to mitigate this risk, including using a friend to spot the weight or using the horizontal safety bars in a squat rack, still leave the risk of human error. To effectively limit the risk of injury and remove the human error potential, we have designed the Automatic Spotting System. This system is designed to work for multiple exercises and to be adaptable for different gym equipment. We accomplished this by researching several technologies including winches, climbing equipment, fall protection equipment, and seatbelt retraction mechanisms. Following our research, we determined that seatbelt retraction mechanisms offered the high weight capacity needed, the ability to safely lock when activated, and an opportunity to recycle otherwise discarded equipment. To implement the seatbelt retractor safely, some internal modifications are required such as the torsion bar (designed to create slack in an accident), as well as the pendulum that locks when the brakes are applied. By performing finite element analysis, the torsion bar was redesigned to reduce undesired stretch, and the pendulum system was adapted to activate when a lifter drops the bar or cannot complete an exercise safely. By implementing this system, lifter safety is improved without the need for a human spotter. This system is especially important in an age where many may choose to work out alone due to COVID-19.

Funding: WVU Tech Department of Mechanical Engineering

62. Improving Management of Rural Water Utilities: Digitizing Drinking Water Distribution Infrastructure Records

Kara Cunningham (Hamlin, WV) Emily Kwiatkowski (Virginia Beach, VA) Nicholas Stoicovy (Clairton, PA)

Institution: West Virginia University Field: Engineering (Engineering) Faculty Advisor: Emily Garner

Possessing accurate records of buried drinking water infrastructure is important to utilities for facilitating maintenance, protecting public health, and planning for asset management. Despite recognizing the importance of this practice, small utilities in West Virginia encounter many challenges because they have very few staff and minimal funds, often relying on paper records that are subject to deterioration and can become outdated as system repairs are needed. Therefore, West Virginia University's chapter of Engineers Without Borders (EWB) collaborated with the Appalachian Community Technical Assistance and Training program to create a model of the existing drinking water infrastructure for Preston County Public Service District #1. The model was created by identifying the distribution system in engineering drawings, using geospatial data from the West Virginia GIS Technical Center, and elevation data from the United States Geological Survey. Pipeline surveys were conducted to resolve uncertainties and identify exact locations of components excluded from engineering drawings. The confirmed infrastructure was uploaded into KYPipe, a hydraulic modeling software. The model allowed the utility to have a more accurate and accessible record of their distribution system so that it could support future asset management and capital upgrades, assist with responding to leaks or technical challenges throughout the distribution system, and facilitate transfer of knowledge between the utility workers. Modernization of records can benefit small water utilities; however, they often lack funding to implement such efforts. Thus, there is a need for local and state support to adequately distribute safe drinking water to the public.

Funding: United States Department of Agriculture, Rural Utilities Service

63. Development of polyelectrolyte multilayer membranes for ammonium recovery from anaerobic digestate

Rebecca Erwin (Wheeling, WV)

Institution: West Virginia University Field: Engineering (Engineering) Faculty Advisor: Oishi Sanyal

This research aims to develop a membrane separation process to treat municipal wastewater for the recovery of liquid ammonia, which can be used as fertilizer. Industrial manufacturing of ammonia is an energy-intensive process and accounts for a significant release of greenhouse gases. Anaerobic digestate (AD), which contain organic carbons (COD), ammonium, and phosphate, represents a promising resource of nutrients which can be recovered for use as fertilizers.

Membrane separation process can be an effective way to treat this wastewater feed, provided membranes with tunable organics/nitrogen selectivities can be designed. Our work focusses on developing such a tunable platform using polyelectrolyte multilayer membrane (PEM) by the surface modification of a loose nanofiltration (NF) membrane (NF 270) using layer-by-layer (LbL) deposition methods. Two polyelectrolytes were used for the surface modification: poly (diallyl dimethyl ammonium chloride) (PDAC) and poly (styrene sulfonate) (PSS). The performance of those PEM membranes were compared against a commercially available NF-90 membrane,which is a "tight" NF membrane. Our initial experiments suggest that in comparison with the commercial nanofiltration/reverse osmosis membranes, these PEM membranes exhibited higher rejection of organic carbon with an equivalent phosphate removal. Furthermore, PEM membranes' low ammonia rejection and high water flux with respect to commercial RO membranes make them more feasible to use against AD for ammonia recovery.

64. Renewable Energy Data Mapping and Integration for the PJM Region

Ashley McCullough (Lumberport, WV)

Institution: West Virginia University Field: Engineering (Engineering) Faculty Advisor: Fernando Lima

The PJM regional transmission organization oversees the movement of electricity to utilities throughout the Eastern US. The growing emergence of alternative energy systems requires location-specific weather data to be studied in their optimization, which is necessary in the greater response to global environmental issues. The goal of this research is to create a seamless software infrastructure based on MATLAB that continuously downloads and maps load and weather data to a centralized Process Information database; this data may be used to motivate further integration of renewable resources in the Eastern US based on predicted fluctuations in weather patterns throughout the day.

To reach this goal, a MATLAB script was created to access PJM data for load, wind, and solar generation and forecast in five-minute intervals through web API calls. This script was constructed to simultaneously write data to dataset-specific PI elements in a local PI database through server connections using the PI-SDK Library. From this database, the data can be mapped and studied on a single trend.

The MATLAB-PI connection system was found to be successful in running independently and writing data to each of the respective PI elements. Results for different profiles of wind and solar generation will be mapped and discussed against load profiles in the PJM region. Continued research will aim to analyze these resources on their power generation and feasibility using time series analysis, and may recognize a single renewable resource as most feasible for the PJM region based on current locational electric systems or plants.

Funding: West Virginia University Office of Undergraduate Research

65. Prolonged Flight Time and Autonomous Functionality in Small Commercial Drone Ayman Seif (Athens, West Virginia)

Institution: West Virginia University Field: Engineering (Engineering) Faculty Advisor: Guilherme Pereira

Small commercial drones equipped with cameras can be used to access constricted spaces, survey its surroundings for threats or danger, conduct surveillance, and gather image data. Small commercial drones of today are useful but are limited by how long they can fly due to current limitations in battery technology. Supplying power through a cable mitigates the limitations of batteries and thus prolongs the flight time of a drone. Prolonged flight time allows the user to assign more interesting and time-consuming tasks to the drone, which can be executed autonomously. In our research we created a power tether system for the Ryze/DJI Tello, which is a versatile commercial drone with a high-definition camera that can be programmed using python. The current battery life on the Tello does not allow for ideal flight time (limited to 7 minutes), so a tether is needed. Variables such as the current and voltage needed for the drone to fly were measured out to be 4.5V and 6-8 Amps. A power interface was created with a battery management system board and a cable was attached to the board. The cable receives the voltage required for the drone to fly from a regulated power supply system. In the current state of the project, the drone can fly for a prolonged period (tested up to 30 minutes) and will soon be coded to autonomously carry out desired tasks. Having a small, versatile drone with prolonged flight time and autonomy will allow for many useful applications in the future.

Funding: Federal Government - Federal Work Study

66. High Resolution 14C Anchors Confirm Tree Ring Dating with Limited Replication

Meagan Walker (Weston, West Virginia)

Institution: West Virginia University Field: Sciences (Environmental Geoscience) Faculty Advisor: Amy Hessl

Radiocarbon (14C) dating has been used to date carbon-rich objects in Earth sciences, archeology, and history since the 1940's. However, the recent discovery of spikes in atmospheric 14C concentration recorded in tree rings has the potential to improve geologic and archeological dating significantly. Developing a history of spikes in 14C, likely caused by solar weather or other cosmic rays, may yield improvements in forecasting solar storms, a hazard to our technological infrastructure. The objective for our research is to identify 14C spikes in tree ring samples from Tasmania, Australia to further develop the global record of 14C variability.

Our research used live King Billy pine cores, and ~100 cross sections from dead trees that date back to 439 BCE in order to analyze radiocarbon concentrations. Core samples that had adequate dating were sectioned using a rotary microtome and underwent the isolation of holocellulose to obtain the 14C concentration. Pure cellulose samples were prepared and sent to an accelerator mass spectrometry at the NOSAMS Institution for radiocarbon calculations. We used this data to compare 11-year patterns to existing series developed in other parts of the world that show the 774/775 CE spike in 14C. Our data of the tree ring C14:C12 series matched those observed in other parts of the world in timing and thus allowing us to confirm the tree ring chronology, and contributing to the global record of 14C variability.

Funding: West Virginia University, National Science Foundation

67. Recycling HDPE Via 3D Printing for Civil and Environmental Engineering Applications Madison Morgan (Huntington, WV)

Institution: Marshall University Field: Engineering (Environmental Studies) Faculty Advisor: Sungmin Youn

The main research objective of this project is to create knowledge on a novel composite material made of recycled HDPE and activated carbon for 3D printing. Many believe that 3D printing is more sustainable than traditional manufacturing, although it has become a true sustainability concern due to the fact that most polymeric material that are used for 3D printing are produced from exhaustive resources. This project uses recycled HDPE material to help increase the sustainability of 3D printing. Activated carbon is also used in this project and is known as the most widely used material to adsorb dissolved containments in water, groundwater, and wastewater treatment. Activated carbon is combined with the recycled HDPE to create a filament that can be used to 3D print deployable and retrievable specimens to remove contaminates from wastewater. This research project is trying to solve the pollution crisis in our water supply. Findings from this project will help clean our rivers and other water sources, to help reduce the negative environmental contaminants.

Funding: Marshall University CECS

68. Coliform Bacteria in the Sediment of Piney Creek, a Tributary of the New River

Rebecca LaRochelle (Mount Hope, WV)

Institution: West Virginia University Institute of Technology Field: Sciences (Environmental Studies) Faculty Advisor: Matthew Williams

The relationship between the issues of bacterial contamination and sedimentation in streams is well-documented but has not been studied in depth in the Piney Creek Watershed, located in southern West Virginia. The streams in this watershed have been known to have problems with both fecal coliform bacteria and sediment. This study aims to see if interactions between those two impairments exist here, which would be that higher numbers of bacteria exist in the sediment of the stream than in the water itself. Fecal contamination of streams poses a public health risk, and bacteria may be present in both stream water and sediment, making the problem more extensive than previously established. The frequency of exceedances of recreational water quality standards was assessed from an ongoing monthly sampling regime that has nearly three years of data. The monthly regime looks at the fecal coliform values along with the total suspended solids (TSS) levels. To understand the relationship between coliforms and sediment a disruption technique was performed, and enumeration of the bacteria was then performed on selective media. Fecal coliform analysis of samples of streambed sediment yielded higher levels of bacteria than water samples from the same sites. A confirmation experiment showed that higher numbers truly came from bacteria in the sediment and not just disruption of complex arrangements of bacteria in the water.

Funded by USGS 104b provided by WVWRI

Funding: USGS

69. Temperature, Oxygen, and Vegetation as Drivers of Microbial Dynamics in Warming Boreal Peatlands

Teagan Kuzniar (Morgantown, West Virginia)

Institution: West Virginia University Field: Sciences (Environmental Studies) Faculty Advisor: Ember Morrissey

Boreal peatlands, a type of wetland, have slow rates of organic matter decomposition due to the water-saturated and oxygen-limited environment. This causes the accumulation of organic carbon and sequesters atmospheric carbon dioxide. Climate warming is predicted to cause increased greenhouse gas emissions from peatlands due to increased rates of microbial metabolism and organic matter decomposition. This is expected to cause a shift in dominant vegetation with a decline in Sphagnum mosses and an increase in Polytrichum mosses. However, little is known as to how vegetation and temperature affect microbial functioning in wetland environments in the presence and absence of oxygen. To investigate these questions, we conducted a warming experiment in both the presence and the absence of oxygen using soil associated with Sphagnum and Polytrichum mosses from Cranberry Glades, West Virginia. Based on soil properties, biomass, and respiration measurements, we found that microbial responses to temperature are dependent upon oxygen availability. This indicates that precipitation changes associated with climate warming, which alters oxygen availability, may determine soil carbon responses to temperature. Additionally, the decrease in microbial biomass along with the increase in microbial respiration could lead to a loss of carbon from wetlands into the atmosphere. This reinforces the idea that carbon is being lost from these ecosystems in warming conditions. The interaction between microbial functioning, temperature, oxygen availability, and vegetation provides valuable insights as to how these ecosystems will respond to climate change on a larger scale.

Funding: West Virginia University Davis College of Agriculture, Natural Resources, and Design

70. The effect of bisphenol A exposure on dyslipidemia and their impact on glucose uptake

Tyler Sine (Martinsburg, WV) Jessica Jones (Fairmont, WV)

Institution: Fairmont State University Field: Health Sciences (Exercise Science) Faculty Advisor: Julia dos Santos

Bisphenol A (BPA), a chemical used in food packaging, has been closely associated with dyslipidemia and obesity. Type 2 diabetes mellitus (T2DM) epidemic has obesity as its major risk factor. Acute exercise has been shown to increase the rate of glucose uptake in normal subjects and T2DM patients, reducing the prevalence of chronic hyperglycemia and related comorbidities. The purpose of this study was to evaluate the rate of exercise-induced glucose uptake and its relationship with urinary levels of BPA with triglycerides and high -density lipoprotein (HDL). Subjects participated in a two-day test where blood glucose, HDL, triglycerides, body fat and urinary BPA were accessed. Participants ingested 50 grams of oral glucose on both days. One day included 30 minutes of exercise (70% HR max) while the next contained rest. Blood glucose was assessed prior to glucose intake and 30, 60 75 minutes after. Overall, exercise increased the rate of glucose transport. HDL, BPA and triglyceride levels did not correlate with glucose transport in either day with or without exercise. However, percentage of body fat was negatively correlated with glucose transport in both days with and without exercise (r=-0.50 and -0.51, respectively). Although the hypotheses that HDL, triglycerides and BPA levels will be correlated with glucose transport rates was rejected, this study produced strong evidence of a positive exercise effect on a hyperglycemic state as well as support that body fat percentage plays an essential role in influencing health risk of T2DM.

Funding: NASA West Virginia- Space Grant Consortium

71. The interrelationship between type 2 diabetes, nutritional behavior, and bisphenol A

Christopher Griffith (Fairmont, WV) Tyler Sine (Fairmont, WV)

Institution: Fairmont State University Field: Health Sciences (Exercise Science) Faculty Advisor: Julia Dos Santos

Type 2 diabetes mellitus (T2DM) has become a recognized epidemic in America, with nutrition being a major risk factor. Bisphenol A (BPA) is a chemical used in food packaging and has been associated with adverse effects on glucose metabolism and obesity. The purpose of this study will be to identify if there is an association between T2DM, nutritional behaviors, and urinary BPA concentrations in college-aged students. Subjects will participate in a two-day study where anthropometric stats will be taken on day one. A urine analysis was also taken on this day. At the end of day one, the subject was provided with a ten-day food log. On day two, the food logs will be gathered, and the data will be analyzed. The urinary analysis will be completed in the laboratory located in Hunt Haught Hall, Fairmont State University, Fairmont, West Virginia. The data will be analyzed using Pearson correlation to see if there is a positive relationship between T2DM risk factors and urinary BPA concentrations. The hypothesis that sources of BPA-laden foods can be identified with a food log and increased consumption of those foods will be correlated with increased FBG, and T2DM risk factors will be tested.

Funding: NASA (NASA grant)

72. Single vape exposure on middle cerebral artery function over a 72-hour period Madison Robinson (Randallstown, Maryland)

Institution: West Virginia University

Field: Health Sciences (Exercise Science) Faculty Advisor: Mark Olfert

Vaping is known to cause impairments in blood vessel function, but little is known about how long vessel dysfunction remains after vaping. We hypothesized that dysfunction would be evident in the middle cerebral artery (MCA) of the brain within 24 hours of vape exposure and recover by 48 hours. We measured MCA vessel reactivity in air-exposed (control) rats and in rats assigned to 2-, 24-, 48- or 72-hour groups following a single 1-hour vape exposure. E-liquid consisted of 50:50 propylene glycol: vegetable glycerin mix with no nicotine or flavoring. Compared to control, the greatest decline in MCA dilation (to either acetylcholine or sodium nitroprusside) was at 24-hours (-51%, p<0.05) and was restored by 72-hours post vaping (-5%, p=ns). Impaired MCA constriction to phenylephrine was greatest at 2-hours (-41% compared to control, p<0.05) and was restored at 72-hours (+2.6%, p=ns). Our data is important because it shows that a single vape exposure causes significant MCA dysfunction that peaks within 24-hours, but takes 72-hours for normal function to be fully restored.

Funding: Supported by NIH Grant R21 ES033026-01, U54-GM104942-05S1, P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence, WVU SURE, HRD Louis Stokes STEM Pathways and Research Alliance: KY-WV LSAMP, 1826763

Funding: NIH

73. Going Green and Dressing Clean

Chelsea Hidalgo (Morgantown, West Virginia)

Institution: West Virginia University Field: Other (Fashion) Faculty Advisor: Angela Uriyo

The garment titled "Going Green and Dressing Clean" was made to embody the path of sustainable living. Sustainable clothing refers to fabrics derived from eco-friendly resources, such as sustainably grown fiber crops or recycled materials. The kimono style garment is composed of a 50% lyocell, 50% linen blend fabric in a toasted almond shade with a 100% linen patch in its natural color, often referred to as linen gray. Both of the fabrics are 100% biodegradable, meaning they are capable of being decomposed by bacteria or other living organisms. The patch placed on the upper center back of the garment includes text that reads "Buy less. Choose well. Make it last" which is a quote by Vivienne Westwood about how to live sustainably in the most simple terms. The patch also reads "We can't just consume our way to a more sustainable world." A quote by Jennifer Nini. I chose to print these quotes on the fabric because I find them both equally inspiring, and they capture the essence of the garment. As far as design aesthetic, I wanted the garment to have an earthy quality while also looking effortlessly chic and versatile. The free flowing fabric and added volume at the hem allow the garment to have movement. The movement embodies the qualities of nature and beautifully captures the wind. Lastly, the garment has green floral details that were block printed along the hem, the sleeves, and the waist belt in order to evenly distribute pops of color and represent nature.



74. Long May She Reign

Charmaine Riestenberg (Kingwood, West Virginia)

Institution: West Virginia University Field: Creative Arts (Fashion Design Studies) Faculty Advisor: Angela Uriyo

Through the practice of identifying a target market, students discover that "one size does not fit all", and that there are many segments of the US population whose needs are not met by the fashion industry's product offerings. Therefore, the aim of this project was to identify a target market whose clothing needs were not being met, and design garment solutions for them using the interview data as justification for design choices.

Lymphedema affects one in five breast cancer survivors. It is caused by the removal of lymph node(s) during a mastectomy or lumpectomy (Sleigh & Biagio, 2019) and causes a buildup of fluid under the skin that can lead to a number of health problems, but mainly swelling in the arms and chest. I began my design process by interviewing 5 women affected by Lymphedema. All of the women interviewed held jobs in professional settings, and struggled finding garments that accommodated swelling, offered them mobility or kept them comfortable and cool throughout the day.

I chose a smart knit fabric infused with aloe that allows for mobility and breathability, while keeping the skin cool and moisturized. The design itself is fit for professional attire, with extended fabric in the armpits for extra mobility, an easy front closure for dressing ease, and a high draped waist to hide insecurities while still giving the illusion of curves. As one of my interviewees said, "*it offers women like me a sense of diversity and comfortability in my wardrobe that other designs couldn't.*"

References

Sleigh, B., & Biagio, M. (2019). *Lymphedema*. StatPearls Publishing LLC. <u>https://www.ncbi.nlm.nih.gov/books/NBK537239/</u>.

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Funding: West Virginia University

75. Responding to gun violence epidemic through technology innovation and statistical interpretations for forensic investigations

Jessica Friedel (Morgantown, West Virginia)

Institution: West Virginia University Field: Sciences (Forensic Science) Faculty Advisor: Tatiana Trejos

Gun violence is one of the most significant problems faced by our society. It is growing at unprecedented levels, requiring an immediate reaction from crime laboratories and law enforcement for accurate scene reconstruction and prompt apprehensions.

This study presents a novel approach (LIBS and electrochemistry) for detecting gunshot residue (GSR) in under five minutes for faster and more effective investigations and case management. Also, this research assesses the frequency of elements in background populations (non-shooters) and expands knowledge to differentiate between GSR-like and authentic GSR samples (shooters) using SEM-EDS.

With the introduction of green ammunition, more elements common to both the environment and ammunition can increase potential false positives. Thus, an extensive dataset of GSR (>3000 samples) was created, including the study of chemical profiles of various populations (e.g., hands from individuals who have recently fired a gun and background non-shooter individuals with a low or high risk of bearing GSR-like compounds).

Having the capability to differentiate between different populations was simpler for leaded ammunition since only 1.8% of the background stubs contained elements characteristic of leaded GSR. Lead-free ammunition was more complex as the associated elements were more prevalent on high-risk samples (elements present on 28-64% of non-shooters). Classification of residues into different populations using machine learning algorithms was achieved with high accuracy (>90%).

This study's innovative technology and data interpretations are anticipated to provide a leap of knowledge in criminal justice and modernize firearm investigations while increasing the reliability of the data presented to the trier of fact.

Funding: National Institute of Justice

76. Land Access in the Italian Alps and How it Influenced Relationships in Premodern Societies

Falon Snodgrass (Bridgeport, WV)

Institution: West Virginia University Field: Humanities (History) Faculty Advisor: Matthew Vester

Historians have long recognized the importance of studying access to land and how land mediated relationships in premodern, rural societies. However, few such studies have been undertaken. A better understanding of these relationships can inform development experts and policymakers working on access to land in today's world. Sixteenth-century notarial records from a French-speaking community in the Italian Alps, Saint Vincent, document how land structured social interactions. These include land sales, mortgages, wills and marriage contracts. They are written in old French script, requiring paleography training to decipher. We read through the available records from the randomly selected year of 1584, took notes based on a number of variables (such as average land prices and parcel size), and compiled the data into a spreadsheet for quantitative analysis. Results showed that land sales often included repurchase rights to use strategically both within and outside of family structures to maintain power, family cohesiveness, and as a form of mutual aid between relatives. We also found that women appeared to maintain much more agency in contracts than expected in a patriarchal society.

77. Horticultural performance of ethylene insensitive etr1-1 petunias

Savannah Mead (Lancaster, Pennsylvania)

Institution: West Virginia University Field: Sciences (Horticulture) Faculty Advisor: Nicole Waterland

Petunias (*Petunia x hybrida*) are among the most popular and economically important crops in the floricultural industry. The value of floriculture crops increases with higher horticultural performance such as aesthetics consistency, uniformity, vigor, and longevity. The flower of *etr1-1*, an ethylene-insensitive mutant, is known to last twice as long (about 14 days) as wild type 'Mitchell Diploid' petunia (MD; 7 days). Horticultural performance between *etr1-1* and MD petunias was evaluated for the potential economic benefit of *etr1-1* usage. Horticultural performance metrics, including nutrient content, biomass, floral longevity, turgidity, and vigor, were compared between two cultivars. MD exhibited higher growth index as an indicator of vigor by 43% (p≤0.0001). The average change in turgidity over a 24-hour postharvest submersion period was similar (P=0.2643). Both cultivars showed similar aesthetic consistency and uniformity at maturity. Better performance of *etr1-1*, indicated by the increased floral longevity and reduced vigor, may offer excellent commercial potential, although other qualities such as tolerance to biotic and abiotic stresses should be considered.

78. Characterizing Humoral Immune Response of Cystic Fibrosis Patients with Clinical History of *P. aeruginosa* infections

Matthew Hudson (Scott Depot, WV) Evita Yang (Follansbee, WV)

Institution: West Virginia University Field: Health Sciences (Immunology and Medical Micobiology) Faculty Advisor: Mariette Barbier

Cystic fibrosis (CF) is a chronic genetic disease that impairs normal breathing and predisposes individuals to bacterial infections. Pseudomonas aeruginosa is among the leading Gram-negative organisms associated with nosocomial infections in CF patients, further complicating treatment as a multidrug-resistant pathogen. In individuals with CF, P. aeruginosa causes acute and chronic respiratory infections associated with significant mortality and deterioration of lung function, despite antibiotic treatment. The objective of this research is to characterize serum antibody response in patients with CF against P. aeruginosa and antibiotic resistance status on isolated bacterial specimens. In this study, serum samples and bacterial specimens were taken from participants never culture positive, free of infection, intermittently infected, and chronically infected. We found that 2 out of 7 P. aeruginosa specimens were multidrug-resistant. Antibody response against P. aeruginosa PAO1 and various clinical isolates was evaluated using ELISAs. Antibody responses were compared to patient age and most recent year of infection. We demonstrated that chronically infected patients have higher antibody responses against P. aeruginosa. Interestingly, P. aeruginosa specific antibody responses were correlated with the most recent year of P. aeruginosa infection. Understanding the role of antibodies in CF patients on *P. aeruginosa* clearance during infection can further existing research in the field in developing novel vaccines, therapeutics, or diagnostic methods. Research furthering the collective understanding of CF and bacterial infections is critically important to improving the health of individuals across West Virginia and could aid in developing innovative solutions to reach rural individuals across the state and beyond.

Funding: WVU Medicine Department of Pediatrics

79. American exceptionalism after 9/11: Dominant narratives in foreign and national security policy Sarah Ihlenfeld (Wheeling, WV)

Institution: West Virginia University Field: Social Sciences (International Studies) Faculty Advisor: Christina Fattore

After a decade of peace and prosperity following the end of the Cold War, the events of 9/11 challenged the dominance of US global leadership, uniquely positioning the Bush administration to cultivate a narrative of stability that Americans so desperately wanted. The administration was able to successfully establish a dominant narrative rooted in long-established American political tropes, which provided a strong sense of ontological security and promised material benefits. This narrative, American Exceptionalism, further specified three constituent tropes: leadership, hawkishness, and protectionism. These narratives were used to justify and build domestic support for American foreign and national security policy post-9/11 and created a political environment in which the United States led a coalition of countries to invade both Afghanistan and Iraq, created the Department of Homeland Security, and passed the Patriot Act with generally broad support from the American public. However, the events preceding and occurring during the invasion of Iraq weakened the ontological security argument and called into question any promised material benefits, challenging the administration with public resistance. I test this by hand coding speeches and statements from members of the Bush administration to identify the presence of the constituent tropes and supporting my findings with public opinion polling to illustrate the decline of support for the administration's policies and the narrative's collapse.

80. An Analysis of Utility Company Customer Service during the COVID-19 Pandemic Bernadette Hoffman (Charleston, West Virginia)

Institution: West Virginia State University Field: Social Sciences (Mathematics) Faculty Advisor: Vincent Smith

Many companies have fared badly in service due to COVID-19 restrictions and changes in the lifestyle around the United States. Consumers within the United States are potentially faced with service interruptions and the inability to resolve issues for services that are necessary for daily life; this is exacerbated by many Americans working from home during the pandemic. The purpose of this research is to analyze the public opinion of Americans living with these service issues via social media. Through the collection and interpretation of this data, we hope that changes may be brought to light. The data was analyzed using natural language processing utilities, and finally, using various inferential statistical methods. The potential implications of the results will be practical for companies moving forward in a post-COVID-19 society. We aimed to show the overall satisfaction of customers during this adjustment period. The research conducted reflected the minimal effect presented by moratoriums ending during our capture dates. Significant results were found between utility types and the overall polarity of customer satisfaction, and possible conclusions are discussed.

Keywords: Sentiment Analysis, Polarity, Utility Company, Customer Service, COVID-19, Coronavirus, Pandemic Moratorium

Funding: West Virginia Science & Research Higher Education Policy Commission and the Title III Part B of the Higher Education Act of 1965

81. Incidence, Prevalence, and Outcomes of Pediatric Trauma in Rural Appalachia From 2017 to 2019

Isabella Balko (Morgantown, WV)

Institution: West Virginia University Field: Health Sciences (Medicine) Faculty Advisor: Pavithra Ellison

Rural pediatric trauma has its unique incidence, presentation, and distribution due to mechanisms of injury, geographic location, access to care, and social issues. We reviewed pediatric trauma in West Virginia from 2017-2019. Trauma database was analyzed, ages 0-18 from 2017-2019 in the Appalachian regions in West Virginia. Gender, injury mechanism, Glasgow Coma Scale Score (GCS) at admission, injury severity score (ISS), toxicology screen results, hospital length of stay, duration of ventilatory support, number of procedures performed during admission, presence of non-accidental trauma, cardiac arrest, patient discharge disposition, and mortality were analyzed.

1182 patients were admitted to the trauma center. 37% female and 63% male. 11-18 age group, 24% female and 76% male. Injuries were: blunt force (89%), penetrating injuries (7.2%) and burns (1.4%). Majority had minor or moderate injuries with 95% receiving a Glasgow Coma Scale (GCS) >13 and 72% listed as minor on the injury severity score (ISS). 0-2 years had the highest proportion of poor (0-8) GCS scores, high ISS (>14) scores, most hospital admission days, days on a ventilator, mortality, most pre-hospital cardiac arrests, child abuse, burns, and placement with child protective services. 31% of children tested, and 17% in ages 0-2 had a positive toxicology screen. There were 3670 procedures done.

Under 2 are most vulnerable to poor outcomes and need preventative interventions. Toxicology screens need to be implemented in pediatric trauma. Rural trauma has endemic issues related to substance abuse, poverty, and lower degree of social support as compared to urban areas.

82. Rare Earth Mineral Recovery Using Food Waste-Produced Reagents

Kayla Gibson (Marlinton, West Virginia)

Institution: West Virginia University Field: Engineering (Mineral Processing) Faculty Advisor: Hassan Amini

Rare earth elements (REEs) have been listed as critical materials in Executive Order 13817 due to the heavy dependency of the U.S. on foreign resources and their vital roles in clean energy and high-tech industries. Unfortunately, the U.S. production of REEs is currently limited by high chemical consumptions leading to 100% net import reliance for meeting domestic needs. For example, the recovery of bastnaesite, one of the few primary sources of REEs in the U.S., requires complex stages of expensive conditioning to effectively reject the associated gangue minerals which are valueless. Simultaneously, the U.S. has an extensive rate of food waste, nearly 40% of produced food, causing dramatic environmental pollution. While challenging, food waste is considered a potential feedstock for producing high-quality organic chemicals. This project concurrently addresses both challenges and develops a novel REE separation process utilizing food waste-produced organic acids to enhance the bastnaesite recovery. As such, systematic mineral flotation experiments were performed to evaluate the impact of various operational parameters, including pH and reagent concentrations, on the flotation performance of bastnaesite. The experimental results indicated that food waste-produced organic acids are effective reagents for minimizing the recovery of gangue minerals (below 10%) while maximizing bastnaesite recovery (over 90%). The outcomes of this research support strengthening the climate, clean energy, and the U.S. economy.

Funding: EPA-P3 Program

83. Introducing Appalachian Music to Piano Students

Sianna King (New Market, MD)

Institution: Shepherd University Field: Education (Music) Faculty Advisor: Yu Hsuan Liao

In piano pedagogy, teachers try to expose their students to different styles and cultures in music, but regional styles are often overlooked. Appalachian music derives the combination of cultures found on the East Coast of the United States in the Appalachian Mountains. There are limited resources available to piano students who wish to learn Appalachian music, and many of these are inaccurate representations of the music's style. One example of the inaccuracies found in Appalachian arrangements is that many exclude the improvisatory nature of the region. In addition, much of the Appalachian music out there that is arranged for piano is mixed in with other American Folk music, which can make it difficult for teachers and students to pick out which pieces are truly Appalachian. The purpose of my study is to provide a broad cultural and locally-based education for students by organizing existing pedagogical pieces and arranging some Appalachian tunes to introduce beginners and intermediate students to the unique stylistic and rhythmic elements of Appalachian music.

84. Investigating Developmental Synaptogenesis in the CNS: Effects of Biological Sex and Prenatal Drug Exposure

James Williamson (Milton, WV)

Institution: Marshall University Field: Health Sciences (Neuroscience) Faculty Advisor: W. Christopher Risher

Developmental synaptogenesis is the process by which neurons form junctions that allow for the transfer of information throughout the central nervous system (CNS). Synaptic abnormalities are found in all neurological disorders as well as in addiction, but the cellular and molecular mechanisms remain elusive. Recent results from our lab indicate that basic synaptogenic mechanisms differ greatly between sexes, with neurons purified from male rats being much more responsive to secreted factors from non-neuronal cells called astrocytes than female neurons. Furthermore, we found that blocking estrogen production by these neurons negated this difference, suggesting sex-specific hormone regulation of synaptogenesis. Our studies of synaptogenic mechanisms also extend to investigations into the long-term effects of neonatal abstinence syndrome (NAS), where infants show symptoms of withdrawal after being exposed to drugs during pregnancy. To model NAS, we dosed pregnant mice with some combination of our drugs of interest, the opioid buprenorphine and the anti-pain medication gabapentin. We then quantified excitatory and inhibitory synapses in brain regions associated with the mesolimbic dopamine pathway, which is heavily involved in addictive behavior. Our analysis revealed that drug-exposed mice generally showed an increase in excitatory synapses and decrease in inhibitory synapses across all regions studied. In addition, combinatorial treatment (i.e. gabapentin plus buprenorphine) showed a synergistic disturbance of synaptogenesis, confirming the dangers of coabuse for neonatal brain development. Taken together, our results have significant implications for the treatment of sex-biased neurodevelopmental disorders such as autism as well as highlight the long-term impact of NAS on brain synaptic development.

Funding: National Institutes of Health

85. Inhibition of cancer cell signaling regulator microRNA-21 decreases tumorigenic capacity in glioma cell lines

Mackenzie Miller (Scarbro, WV)

Institution: West Virginia University Institute of Technology Field: Health Sciences (Neuroscience) Faculty Advisor: Adrienne Williams

Glioblastoma multiforme (GBM) is the most aggressive and malignant brain tumor, which is in part due to GBM's high invasiveness and progression. Despite many efforts, GBM patients still have a poor median survival of 14-15 months after diagnosis. The aggressiveness of GBM is presumably due to cell signaling pathways that promote cell survival and tumor formation. MicroRNA-21 (miR-21) is a known gene regulator that is increased in GBM and has been used as a diagnostic marker for cancer. MiR-21 promotes cancer cell spread and resistance to chemotherapy, therefore miR-21 could serve as a potential therapeutic target. The purpose of this study was to determine if inhibiting miRNA-21 in the glioma cell line LN229 would prevent formation and growth of tumor neurospheres in plate culture. A previously established cell culturing technique using neurosphere medium for the glioma cell line LN229 was used to induce tumor formation to study the effects of microRNA inhibition on tumor development and growth. Transfer of microRNA-21 inhibitors are compared to mock transfer and scrambled (inactive) inhibitor controls. After treatment, cells cultured in neurosphere medium were monitored daily with pictures taken every 2-3 days to monitor neurosphere number, size, and cell viability assays performed as well. MicroRNA-21 inhibition showed significant decrease in neurosphere number and size compared to controls. However, no significant difference was shown in the cell viability across conditions tested. In conclusion, miR-21 inhibition hinders tumor neurosphere 3dimensional structure but not cellular replication and may be a useful target for improving chemotherapy treatments for GBM.

86. Dim Light at Night Reduces Cerebral Vasculature Structure in the Hippocampus of Mice Rhett White (Clendenin, West Virginia)

Institution: West Virginia University Field: Health Sciences (Neuroscience) Faculty Advisor: Randy Nelson

Circadian rhythms are endogenous and drive physiological and behavioral processes with a period of about 24 hours. These rhythms are synchronized to the 24-hour solar day through daily exposure to light. Artificial dim light at night (dLAN) is a ubiquitous aspect of modern life that 99% of Americans experience, and exposure to dLAN can disrupt circadian rhythms. For example, four nights of dLAN is sufficient to disrupt circadian rhythms and have adverse physiological effects, such as increased central inflammation, altered angiogenic signaling, and increased depressive like behavior in mice. Because of the role of the hippocampus in depression, in the present study, we sought to examine the effects of dLAN on hippocampal cerebral vasculature structure. Female and male adult CFW mice were assigned to either a standard light-dark cycles or placed in dLAN (~5 lux). After four nights, the mice were euthanized and perfused using PUii resin for corrosion casting imaged using a μ CT scanner for analysis. Our results indicate that after only four nights of dLAN exposure, female and male CFW mice have reduced vasculature in the dentate gyrus, CA1, and CA3 of the hippocampus. Reduced cerebral vasculature in humans is correlated to an increased risk of stroke and dementia.

Funding: National Institutes of Health

87. Identifying Home Care Needs of Families Living with Heart Failure and Vascular Dementia Serenity McDill (Hedgesville, WV)

Institution: West Virginia University Field: Health Sciences (Nursing) Faculty Advisor: Ubolrat Piamjariyakul

Background: Vascular dementia, the second most common type of dementia after Alzheimer's disease, is characterized by having problems with reasoning, planning, judgment, memory and other thought processes caused by impaired blood flow to the brain from heart failure (HF). This study identifies home care needs and challenges for these families living with vascular dementia.

Methods: This was a qualitative research design. Adult (>55 years) HF patients (NYHA II & III, or Stages B & C), with vascular dementia (mild to moderate stage) (n=4) and non-paid family caregivers (n=6) completed open-ended interviews. Thematic analysis was used to analyze the transcribed data.

Findings: Major themes were centered around disease process, emotional difficulties, and impact on the caregiver. Patients' concerns included: lack of information on illness and palliative care from their healthcare providers; multiple health conditions; help with medication management; frequent falls; difficulty communicating due to forgetfulness; fatigue; lack of activities; loss of hearing; self-isolation due to fear of judgement; lack of independence; hopelessness; and fear of caregiver getting sick or dying.

Notably, caregivers spoke of many responsibilities which included complex HF management, managing depression, providing total care, emotional support, and transportation. Family caregivers felt overwhelmed. Caregivers mentioned lack of home care options, palliative care, and community resources. Many caregivers felt hopelessness and perceived that nothing would slow down the dementia progression.

Conclusion: The results indicated that family home care intervention, community resources, and palliative care provisions for providing HF specific vascular dementia home care in rural settings are needed.

Funding: NINR

88. Understanding radiation's potential in drug delivery across the blood-brain barrier Morgan Glass (Triadelphia, WV)

Institution: West Virginia University Field: Health Sciences (Pharmaceutical Sciences) Faculty Advisor: Paul Lockman

The leading cancer diagnosis of West Virginians today is breast cancer, which is behind only lung cancer in risk of metastasis to brain. Noninvasive treatments of brain metastases remain limited largely because of the blood-brain barrier (BBB). The BBB is an evolved protective mechanism, which prevents potentially dangerous molecules from entering the brain through the bloodstream, unfortunately including most chemotherapies. This stems from the anatomy of the brain's capillaries, which are highly specialized with a foundational layer of endothelial cells braced together with tight junction proteins. Other proteins termed efflux transporters kick out additional molecules attempting to cross. Overall, drugs successful in the body are unable to reach the brain cancer at cytotoxic concentrations. Literature and clinical data suggest radiation therapy is capable of inducing temporary integrity changes at the BBB, allowing for increased passage of chemotherapy into brain tumors. Interestingly, effects of radiation-induced disruption at the molecular level are not fully understood. To better understand the effect of clinically relevant radiation on BBB integrity at the molecular level, brain capillaries were isolated from mice treated with radiation, and principal barrier proteins were measured via western blot. Preliminary data supports the predicted downregulation of specific barrier proteins. To inform future in vivo permeability studies to align with molecular data, brain tissue samples exposed to fluorescent tracers at different concentrations were imaged, and standard curves were generated. While radiation remains an important tool for treatment of brain metastases, further study of its effects on the BBB is crucial.

Funding: National Institute of Aging at the National Institutes of Health (#T32 AG052375)

89. Chronic Stress Increases the Production of Xanthine Oxidase in the Liver of C57BL/6J Mice

Phillip Englund (Hurricane, WV)

Institution: West Virginia University Field: Health Sciences (Physiology) Faculty Advisor: Dr. Paul Chantler

Chronic stress can be correlated with an increased risk of various vascular diseases. Past work in the lab has shown that chronic stress induces cerebrovascular dysfunction possibly caused by an increase of oxidative stress. One possible source of this oxidative stress is Xanthine oxidase. Xanthine oxidase is an enzyme that is found in high quantities in the liver. We hypothesize, that during times of high stress and inflammation Xanthine oxidase is upregulated in the liver and overflows into the vascular tissue, producing superoxide that binds to vessels inflicting damage. This study focuses on making a connection between Xanthine oxidase production in the liver and its role in chronic stress. This was accomplished by conducting an 8-week unpredictable chronic mild stress protocol (UCMS) on mice that received drinking water that was and was not treated with 50 mg/L febuxostat (Xanthine oxidase inhibitor). The mice were euthanized after the conclusion of the 8-week UCMS protocol, and the amount of Xanthine oxidase produced in the liver was quantified using western blots. Analysis of the data collected from the western blots showed that there was an increase in production of Xanthine oxidase in stressed mice compared to mice that were not stressed. Furthermore, there were no significant differences in mice that were stressed and treated with febuxostat and mice that were stressed and not treated with febuxostat. These data suggest that Xanthine oxidase does have a role in the vascular damage associated with chronic stress.

Funding: NIH

90. A Look at Educational Inequality Across Socioeconomic Statuses

Alyssa Nazarok (Shepherdstown, WV)

Institution: Shepherd University Field: Social Sciences (Political Science) Faculty Advisor: Samuel Greene

Inequality in educational outcomes between students of low and high income has been prevalent in countries around the globe for decades. It has remained difficult for some countries to find a solution to this issue but other countries have greatly improved their equality in educational outcomes. The difference here has prompted the research question, why do certain countries have more socio-economic equality in secondary education outcomes than others? In reading the current literature on this topic, it became clear that many researchers have looked into the effects of school choice programs and alternate program use on students of low income. Due to this finding, the hypothesis being evaluated in this paper is that the greater the percentage of the school-aged population not in public school, the greater the inequality in equity in educational outcomes there will be. The hypothesis was supported with the direction of the relationship but was very, very weak and not statistically significant. Control variables were utilized, and education spending was found to have the strongest relationship with inequality of education performance although this relationship was also not statistically significant. The two control variables that were statistically significant were not in the direction predicted and held a weak relationship.

91. Voter Apathy

Kasey Lyons (Gallipolis Ferry, WV)

Institution: University of Charleston Field: Social Sciences (Political Science) Faculty Advisor: Kara Fisher

Voter apathy is commonly defined as the lack of interest and participation of voters in the electoral process. Voter apathy has been an issue since the foundations of democracy were established. However, in my research I study the increase in voter turnout in recent years and the potential factors contributing to this rise. I focus on understanding if the increased voter turnout among young voters in 2020 is the start of a trend of greater participation. I measure voter apathy by observing voter turnout over the past 3 election years and comparing to the recent 2020 election using data from the Pew Research Center. Specifically, I investigate the dynamics of voter age and party outreach. In the current climate of social media and technology, both parties are appealing with greater emphasis through positive and negative messaging using technology. I analyze the methods of communication that each president used in the previous election year as a marker of voter engagement trends.
92. Perfectionism, Academic Performance, and Mental Health in Undergraduate Students Brittany Rowe (Avondale, WV)

Institution: Concord University Field: Social Sciences (Psychology) Faculty Advisor: Rodney Klein

Perfectionism is a personality trait that involves striving for perfection and setting excessively high standards, while acting as the source of adaptive and maladaptive behaviors. Examples of adaptive perfectionism would include punctuality and attentiveness while maladaptive tendencies would include procrastination and self-doubt. Previous research has shown that as society changes, perfectionism in undergraduate students, which has a direct effect on student wellness, is increasing. The current study is being conducted to examine the relationship between academic performance, mental-health, and perfectionism among undergraduate students. Participants will complete the Hewitt & Flett Multidimensional Perfectionism Scale, the Mental Health Index-5, and will be asked for their GPA. I hypothesize that there will be a nonlinear relationship between perfectionism and mental health, a nonlinear relationship between perfectionism and academic performance, and a linear relationship between positive mental health and academic performance. Understanding the relationship between these variables can guide us in providing the appropriate resources for students to improve mental health and reach their peak academic performance.

Funding: McNair Scholars Program (Trio)

93. Mental Health of College Students During a Pandemic

Olivia Rodgers (Middletown, MD)

Institution: Shepherd University Field: Humanities (Psychology) Faculty Advisor: Tomas Yufik

In March of 2020, the World Health Organization labelled SARS-CoV-2 (Coronavirus) a global pandemic, and countries immediately began taking precautions to avoid the spread of this virus. The United States was put under a state of emergency and quarantine measures were placed. Schools were shut down and college students were sent home. As a result of this, education moved online. The present study examines the effect of the Coronavirus pandemic on the mental health of college students. The data for this research was collected through a series of self-reported questionnaires administered online. Participants were asked to complete a demographic questionnaire, followed by four self-report surveys measuring anxiety, depression, personality, and PTSD. We excluded participants under eighteen years of age, those who are not currently enrolled in a college or university, and those who have had a traumatic brain injury. Preliminary results indicate that students were negatively affected by Covid. Some participants showed increased symptoms of depression, anxiety and trauma. With this research, we can begin to explain if and how the coronavirus pandemic has impacted the mental health of the general population.

94. How Does Mortality Salience Affect American Attitudes Toward the Events of January 6, 2021?

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Mortality salience (MS) is the concept of being aware of one's own inevitable death. When someone is exposed to MS, their cultural worldview (how one views the world) helps to protect from the awareness of death (Pyszczynski, Solomon, & Greenberg, 2003). This study seeks to discover how MS affects American citizens' attitudes toward the events at the United States Capitol building on January 6, 2021. This study will compare conservative and liberal attitudes toward the event. The hypothesis is that conservatives will become more accepting of the events with exposure to MS, while liberals will become less accepting with exposure to MS. Conservatives and liberals will be randomly assigned to an experimental or a control condition; the experimental group will experience MS, while the control group will not. Both conditions will be exposed to news footage from January 6, 2021. Both groups will be pre-screened for their political affiliation and, following exposure to their respective condition, given a questionnaire about their attitudes toward the events at the Capitol. Attitudes toward the events will then be compared. The importance of this study relates heavily to the current state of politics. The political parties are more divided than ever, and this study seeks to examine that division and one potential cause. The events at the Capitol on January 6 have created a further divide between parties, and MS may perpetuate that divide. WV is politically divided, and everyone has to deal with the consequences.

95. Mortality Salience and the Effects on Stereotypical Attitudes Towards Mexican Americans

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Terror management theory suggests that awareness of our death (MS) leads to hostility toward those who are different (Pyszczynski, Solomon & Greenberg, 2003). When individuals are made mortality salient and experience a threat to their worldview, they will defend themselves from these horrors, and stereotyping functions as a defense mechanism. This study intends to examine how (MS), and cultural worldview (CWV) threat will affect the level of acceptance of negative Mexican stereotypes. This study is relevant because, after the 2016 election, there was a lot of stereotyping against the Mexican community. This minority group needs to be researched because of the vast numbers of Mexicans living in the US. I hypothesize that the MS and CWV threat condition will experience the highest level of stereotyping, while individuals in the no mortality salience and no CWV threat should experience the lowest level of stereotyping. The study will also examine political ideology to test if liberals and conservatives lead to more stereotyping. The hypotheses of the present study will be tested in a 2 (MS present, MS absent) by 2 (CWV threat, no threat) by 2 (conservative or liberal political ideology) factorial design. MS will be manipulated by showing Ps a slide show of images of death or neutral images, and the threat condition will be manipulated by showing participants an essay derogating the united states or a control essay. The study is relevant to West Virginia because the Mexican community has increased in the state, and the community needs to be researched.

96. Long term memory between the type of words

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Institution: University of Charleston Field: Social Sciences (Psychology) Faculty Advisor: Dr. Jason Newsome

The goal of this research is to look at the processing and awareness needs that mediate between long and short-term memory. I believe that those in the experimental group will recall more words, whilst those in the control group will remember fewer words. I also hypothesize that delayed time is related to recall. Participants (Ps) will participate in the study as follows: Ps will read and sign consent forms at the beginning of the study, ensuring their informed consent to participate. Ps will randomly be assigned to condition. The conditions will be determined by the distinctiveness of words (distinctive, common). Ps will be randomly assigned to the conditions and then will be showed a slide show where the experimenter group will receive distinctive words and the control group will receive common words. Then Ps will have to write down as many words as they remember in each paper. After exactly one week they will be called back to write down as many words as they have remembered from the slide show that was showed to them. Research on the science of forgetting suggest that regular review of information is important in order to store that information in your long-term and short-term memory. As a result, the significance of this research is the practical application of fundamental research in everyday life. It also aids research into the significance of high-level cognition. Memory Is a fascinating and vital instrument, and this study may be able to assist in demonstrating its notion.

97. Intersecting Identities on Our Country Roads: Depression Among Diverse Adults in West Virginia

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Institution: West Virginia University Field: Social Sciences (Psychology) Faculty Advisor: Julie Patrick

Despite having a substantial LGBTQ+ population of 57,800 adults and 10,300 youth, West Virginia has the lowest societal acceptance of LGBTQ+ people in the country (Mallory et al., 2021). The LGBTQ+ community is more prone than non-LGBTQ+ communities to be diagnosed with depressive disorders and health inequalities due to prejudice (Mallory et al., 2021). LGBTQ+ status intersects with other identities, including gender, age, and race. Given that such intersectionality may influence depression, understanding how gender, age, and race interact with sexual orientation (SO) is important. Thus, the current study examined the effects of gender, age, race, and SO on depression among WV adults.

We used the 2020 Behavioral Risk Factor Surveillance System that included 5,415 West Virginian adults (younger adults ages 18-44, middle-aged adults ages 45-65, older adults ages 65-80). Using an ANOVA, we examined depression as a function of gender, age, race, and SO.

The ANOVA revealed a significant overall effect, F (37, 5377) = 8.387, p < .001. There was a significant main effect of age, sex, and SO. These main effects and 2-way interactions were further modified by a significant 3-way interaction among age, sex, and SO, F (6, 5377) = 2.667, p = .014 and a significant SO*sex*race interaction, F (2, 5377) = 3.633, p = .026.

These findings suggest that to best understand how SO influences depression in WV, one must also examine sex, age, and race. The present study provides an intersectional lens to understand health disparities in marginalized groups of WV adults.

98. Place-based disparities and education as predictors of disability in older adults

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Institution: West Virginia University Field: Social Sciences (Psychology) Faculty Advisor: Julie Patrick

Older adults are more susceptible to chronic health conditions, leading to increases in depression and function disabilities (Chapman & Perry, 2008). People in these areas face place-based disparities, which contribute to inadequate funding and/or lack of educational opportunities, which may also have direct effects on disability rates. The National Long Term Care Surveys found that males and females with higher education maintained better functioning at later ages than those with low education (Manton et. al). For the study, place-based disparities affecting middle-aged and older adult West Virginia Residents were observed and recorded using the CDC's 2019 Behavioral Risk Factor Surveillance System. It was hypothesized that age, gender, the number of chronic health issues, the level of education attained, and depression would all contribute to increased rates of functional disability. Participants (n=3794) were residents of West Virginia and over age 50 years. Among the adults, 57.2% were women. The mean age was 63.6 (SD = 8.9, range 50 to 80+). Results suggested a good fit of the model to the data, $\chi 2$ (DF = 16) = 381.7, p < .001, with CFI = .90 and RMSEA < .08. Specific associations were also significant, including three direct links with functional disability for: depression ($\beta = .25$), number of chronic health conditions $(\beta = .40)$, and education $(\beta = -.14)$. These findings suggest that researchers should focus more attention on decreasing both chronic health conditions, depression, and generational education changes to combat disability among middle-aged and older adults in West Virginia.

99. Characterization of Agouti-Signaling Protein Expression in the Bovine Ovarian Follicle

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Institution: West Virginia University Field: Sciences (Reproductive Physiology) Faculty Advisor: Jianbo Yao

Proteins and mRNAs present within an oocyte determine its developmental competence, or the ability to resume meiosis, cleave, and result in a healthy pregnancy. Previous data have identified agouti-signaling protein (ASIP) mRNA to be highly expressed in the bovine germinal vesicle (GV) oocyte, however the function of ASIP in the bovine ovary has not yet been identified. The goal of this study was to characterize ASIP expression in cells from large and small follicles including cumulus, granulosa, and theca cells and GV and MII oocytes. Ovaries were obtained from a local slaughterhouse and small (3-5 mm) follicles (n = 6) and large (8-18 mm) follicles (n = 6) were dissected for theca and granulosa cell isolation. Cumulus-oocyte complexes (COCs) were aspirated and GV oocytes were collected. Additional COCs were collected and underwent in vitro maturation (IVM) to obtain MII oocytes. RNA was isolated from all cells and cDNA was synthesized. ASIP expression was examined using RT-qPCR and relative expression was calculated using the standard curve method. Expression of ASIP was detected in GV and MII oocytes and all follicular cell types. Follicle size did not affect ASIP expression in follicular cells or GV/MII oocytes (P < 0.05). Both GV and MII oocytes expressed ASIP significantly higher than all follicular cells examined (P < 0.001). Overall, ASIP is highly expressed in the GV and MII bovine oocyte which may have an effect on oocyte competence. Future work will include functional studies to determine whether ASIP is an indicator of oocyte competence.

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100. Representation in Video Games: Examining the Portrayal of Minorities in Gaming

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Institution: Concord University Field: Social Sciences (Sociology/Social Work) Faculty Advisor: Katie Pridgen

Video Games are often looked at differently than similar forms of media, such as music, film, and television. As such, we tend to ignore the fact that representation in video games is being ignored by developers. In order to combat this, a study was conducted with a variety of games that have either a large amount of positive or negative minority representation, focusing specifically on female, race, and LGBTQ minority representation in the games. Additionally, the question of protagonists falling into these categories was also considered. After conducting this study on each individual group to arrive at conclusions for each data set, the reason behind the current circumstances for each group was examined through a sociological lens.